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PRACTICAL PEDIATRICS

A MODERN CLINICAL GUIDE IN THE DISEASES OF INFANTS AND CHILDREN FOR THE FAMILY PHYSICIAN

BY

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WITH

AN APPENDIX UPON

DEVELOPMENT AND ITS ANOMALIES

BY

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CHAPTER XVI

DISEASES OF THE NERVOUS SYSTEM

DISEASES OF THE BRAIN MEMBRANES AND BRAIN

Congenital Malformations of the Brain

As Holt says, many of these conditions are only of pathologic interest because "they are incompatible with life." Thus the condition of anencephalus, absence of brain, shown in the accompanying illustration meant speedy death to the subject. It is important to recognize

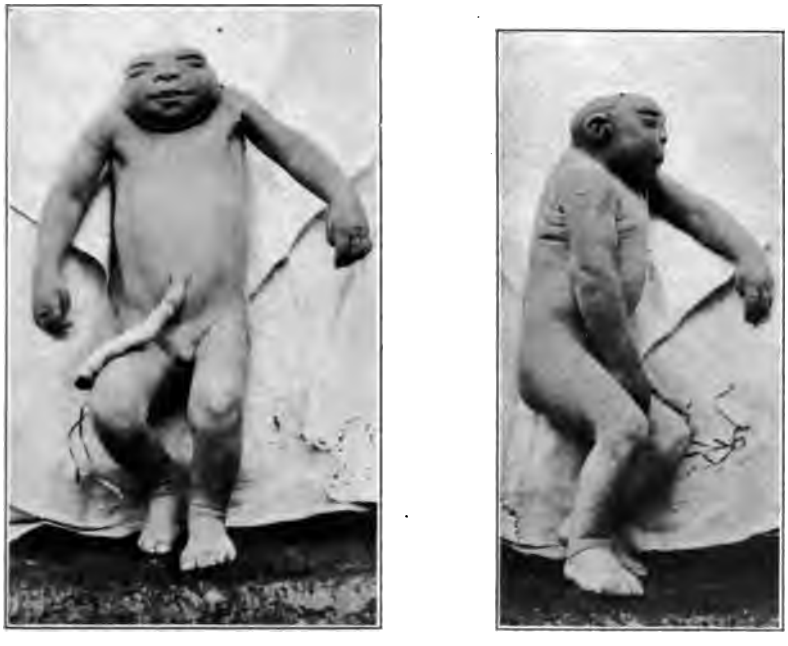

Fig. 62.—Anencephalic Monster.—(*Samaritan Hospital.*)

meningocele (protrusion of brain membranes through the skull), encephalocele (protrusion of the brain) and hydrencephalocele (protrusion of brain substance, containing a cavity which communicates with the ventricular system). (See illustration.) Microcephalus, congenital hydrocephalus and parencephaly will be considered under different headings.

PACHYMENINGITIS

Synonym.—INFLAMMATION OF THE DURA MATER

The Dura.—The dura mater consists of two layers. The outer layer of this structure not only covers the brain; but it also acts as a periosteum for the cranial bones, becoming continuous at the edges of the skull foramina with the pericranium.

The inner layer furnishes the projection processes—the falx cerebri, the falx cerebelli and the tentorium. At every one of the foramina it also forms two tube-like processes—the outer one attaching itself to the periosteal layer of the dura, the inner one being prolonged upon the nerve or vessel passing through that particular foramen. The olfactory

FIG. 63.—FRONTAL MENINGO-ENCEPHALOCELE, NINE WEEKS OLD. (Alive Nov. 20, 1905.)—(*Patrick G. Lee Eye, M. D., Cork, Ireland.*)

and optic nerves are invested by lengthy prolongations of the dura mater. The dura mater of the brain is not continuous with that of the spinal cord.

As a matter of fact, inflammations of the dura and of the pia arachnoid are often associated. But they may have different sources of origin, and at times, the resulting inflammation may be confined to one or the other structure. It is customary, therefore, to furnish separate descriptions of pachymeningitis and leptomeningitis.

Etiology.—In the main, pachymeningitis is due to disease of the contiguous bony structures. It is thus comparable to periostitis. Infective processes in the nasal cavities, orbit or middle ear may extend to the dura. Subsequently the inflammatory process may invade the leptomeninges. Again it may involve the sinuses (infective sinus thrombosis). In the spinal canal, pachymeningitis is usually tubercu-

Symptoms.—There is no special symptomatology, apart from that of the antecedent condition, and from that which will be described in considering every type of meningitis, etc. Paraplegia usually results from inflammation of the spinal dura.

HEMORRHAGIC PACHYMENINGITIS

Synonym.—HEMATOMA OF THE DURA

Etiology.—Occasionally this occurs in children during the first three years of life. It is observed particularly during certain febrile diseases and in patients of poor vitality. The fevers in which it most often occurs are smallpox and typhoid; but it is also seen in pneumonia, gastroenteritis, tuberculosis and eczema. Hemorrhagic diseases too, such as scurvy, may produce it, as in one of our cases.

Pathology.—The lesions are seen on the inner surface of the dura and on the convexity of the brain (in the region of the middle meningeal artery and the superior longitudinal sinus). There are two pathologic stages: 1. pachymenigitis; 2. hemorrhage. Subsequent to round cell infiltration, a separation of the endothelial lining occurs that has been compared to the formation of a blister. In the cavities so formed, lamellæ of fibrin mixed with round cells occur, which soon contain numerous blood-vessels of large caliber but capillary walls. The walls are found in a state of fatty degeneration; thus the occurrences of hemorrhages and hematomata are readily explained. There is usually one patch of considerable size, and this may be unilateral or may spread and become bilateral. Sometimes there are two or more patches. Early there may be liquid blood; later a red or laminated clot; still later, a cyst with laminated walls and yellowish-brown liquid contents.

Symptoms.—In young cachectic children the disease may occur without symptoms. In other cases, there is evidence of increased intra-cranial pressure, and these symptoms may terminate in fatal convulsions. In a few cases, lassitude, severe localized headache, vomiting, myosis and slight convulsions may precede the severe symptoms. Usually there is a rapidly fatal issue; but in several cases, old cysts, presumably of this nature, have been found in children dying of other causes.

Diagnosis.—This is ofttimes impossible, and even when symptoms of increased intra-cranial pressure are present, it is difficult. A consideration of the disease with which it is associated may prove helpful. It should be differentiated from sinus thrombosis, acute

meningitis of other forms, and cerebral tumors. Sinus thrombosis has its own associates, such as ear disease. Lumbar puncture, with a careful study of the fluid obtained will reveal generally the existence of other forms of meningitis—usually the variety. Brain tumor is of slower onset, and has its own general and focal symptoms.

Prognosis.—As previously stated, the disease is usually fatal.

Treatment.—This is largely symptomatic and wholly unavailing.

Pressure symptoms may be relieved by lumbar puncture. A boy of nine years, seen by one of us in the practice of Dr. Haig of Philadelphia, may have presented a case of this nature. He developed marked meningeal symptoms after an attack of typhoid fever. It was thought that he had tubercular meningitis. A lumbar puncture was performed, and the fluid obtained was carefully studied. It contained but 1 per cent. of albumin, no sugar, and few cellular elements. The few staphylococci found clearly represented an accidental contamination. Much to our surprise he made an immediate and complete recovery. We cite this case with hesitation as it may have been one of serous meningitis.

Leptomeningitis

The pia arachnoid resembles many of the other serous membranes lining bodily cavities: Thus, there is a highly vascular visceral layer which follows exactly the surface of the brain, dipping into the sulci, and through the great transverse fissure into the ventricles. Here it becomes the velum interpositum, which carries the choroid plexuses of the lateral and third ventricles. It represents, in fact, the vascular network formed by the subdivision of the cerebral and cerebellar arteries, held together by delicate connective tissue. The middle layer (arachnoid) is non-vascular, and projects over the sulci, not into them. The space between it and the visceral layer (pia) is styled the subarachnoidean space. Thus, as stated, the pia arachnoid may be compared in many ways to the peritoneum, pleura, etc.

Leptomeningitis is always accompanied by cerebritis. With the possible exception of serous meningitis, inflammations of the leptomeninges are always bacterial in origin. In contradistinction to inflammations of the dura they are general, not local. The inflammatory processes may indeed be more marked in certain regions than in others. (The base, the vertex and spinal cord.) This is accounted for in several ways. The usual pathways of infection are through the pharynx, the nose, the ear, etc. The flow of the cerebrospinal fluid is a determin-

ing factor. At the base there is also less close apposition with the skull. Such localizations of the inflammation lead to the employments of the terms *vertical, basic, posterior basic, ventricular, spinal* and *cerebro-spinal meningitis.* However, the best classification at the present day is an etiologic one.

Lumbar Puncture

This diagnostic procedure, first described by Quincke in 1892, has proved of such inestimable value that we shall devote some space to its consideration before considering the various forms of meningitis. The first essential to its proper performance is scrupulous surgical

Fig. 64.—Lumbar Puncture. The puncture is made in the third lumbar interspace. A heavy line is drawn from the crests of the ilia to show the site of election.

cleanliness. The skin of the patient and the hands of the operator are carefully cleansed. The instrument to be used, preferably, in our experience, a small trocar and canula, is boiled for at least ten minutes. The site of election is the third lumbar space. This may be found readily by drawing a line from one crest of the ileum to the other. Such a line passes through the Quincke space. The puncture may also be made in the second, the fourth, or the lumbosacral space (see illustration).

If the patient is an infant, it is usually possible to make the thrust in the center of one or another of these spaces. The instrument

may pass straight forward for one or two centimeters. The index-finger is held firmly on the instrument to keep it from passing too deeply. Hemorrhage into the cauda equina has occurred from wounding the veins of the anterior plexus. In older children the spinous processes overlap, and it is necessary to make the thrust in a slanting direction—upward, forward and inward. One readily learns to detect the lack of resistance when the instrument enters the spinal canal. The trocar is now withdrawn, and usually the fluid flows out through the canula. A dry tap may result from several causes: One may have pushed the membranes in front of the instrument. Again, the fluid may be too thick to flow (pus). Fibrin or blood may also choke the canula. To overcome these obstacles, the trocar is re-introduced and withdrawn, and if the fluid still refuses to flow the whole instrument is pushed in somewhat deeper. Sometimes one may secure the fluid from one lumbar space and not from another.

In our experience, pressure studies have proved well-nigh valueless. A slight deviation in the direction of the canula may influence the force and rapidity of flow. Again the fluid may begin to flow with great force and yet a small amount be obtained; while, on the other hand, large amounts of fluid may pass through the canula drop by drop.

The technic employed in the examination of cerebrospinal fluid is of vast importance. To afford us the greatest amount of diagnostic information, it should involve four steps: First, the physical examination of the fluid. Second, the chemical study. Third, the cytologic examination. Fourth, the bacteriologic study. In the presence of syphilis, an additional study should be made, viz., the search for the Wassermann and Noguchi reactions.

1. The physical characteristics of the fluid: In tuberculous meningitis and in serous meningitis the fluid is clear, and is often compared to spring water. In septic meningitis, epidemic meningitis, pneumococcic meningitis and the influenzal type, the fluid may be cloudy or may be thick pus. In epidemic cerebrospinal meningits, we may also find bloody fluid.

Cerebrospinal fluid always contains some fibrin; and in any form of meningitis this is increased. In all types except the tuberculous, the fibrin tends to settle on the bottom and sides of the containing test-tube after the latter has stood for a short time. In the fluid obtained from a case of tuberculous meningitis, the fibrin is liable to assume a very characteristic form—*a long slender filament* extending through the liquid.

2. The chemical examination: Sugar may be found in minute percentages in normal cerebrospinal fluid. In tuberculous meningitis, the fluid may contain larger amounts. Sugar is not found in any other form of meningitis. Albumin exists in normal cerebrospinal fluid (0.5 per cent.). In serous meningitis, it is but slightly increased (1 per cent.). In epidemic meningitis and the various pyogenococcic forms mentioned, albumin exists in larger amounts (3 to 5 per cent. volume by centrifugation). Higher percentages of albumin than these point toward the existence of tuberculous meningitis. Globulin may be present in any form of meningitis.

3. The cytologic study: This is of vast importance. Normal cerebrospinal fluid contains but few cells and these are hard to find. In tuberculous meningitis and occasionally in syphilis, the total number of cells is greatly increased, and the lymphocytes preponderate numerically over the polymorphonuclear cells. (In one of our cases 94 per cent. of the cells were lymphocytes.) In all other types of meningitis the cells are principally of the polymorphonuclear variety.

4. The bacteriologic examination: This may be pursued in a number of ways; but we have been most favorably impressed by two methods: 1. That in which the fibrin is teased out, spread on a coverslip, dried and stained directly for bacterial elements. This is particularly useful in finding tubercle bacilli (Hand and others). 2. That in which the fibrin is digested before centrifuging the fluid.

Culturing and animal inoculations may also be pursued.

Serous Meningitis

This is a form of inflammation of the meninges in which there is an increase of the cerebrospinal fluid accompanied by pressure symptoms; but in which the fluid is bacteria-free and presents little chemical and cytologic deviation from the normal. There are some authorities who doubt that this form exists.

Etiology.—It has occurred in the course of certain infectious disease; in connection with middle ear disease, in uremia, and following injuries to the head.

Practically nothing is known of the pathology.

Symptomatology.—The symptoms are not readily distinguished from those of meningitis due to other causes. Recovery may take place, however, after the excess of cerebrospinal fluid has been withdrawn by lumbar puncture. The following is an illustrative case: A Russian-Jewish boy, three years old, was seen by one of us with Dr.

Jacob of Philadelphia. He had been taken ill suddenly two days before, the onset being marked by convulsions and high fever. His temperature had continued to range between 103 and 105. His left pupil was larger than his right. He had twitching movements of the left facial muscles. His abdomen was retracted. He had bilateral Kernig and Babinski phenomena. Fifty centimeters of fluid were obtained by lumbar puncture. This fluid was examined by Dr. Alfred Hand, Jr. He reported the fluid clear, depositing little fibrin, containing 1 per cent. of albumin and no sugar, exhibiting few cellular elements and no bacteria. Two hours after the puncture, the boy's temperature fell to the normal point and he sat up in bed and demanded his supper. He showed no further symptoms. Subsequently, it was learned that two days before he was taken ill he had fallen and had struck his head violently against a curbstone.

Diagnosis.—This can be made only by the careful study of the cerebrospinal fluid.

Prognosis.—If lumbar puncture is performed, the patient may recover. Willson has shown that even in the presence of uremia, symptoms may disappear for long periods of time.

Treatment—Lumbar puncture furnishes our only known method of relief.

Tuberculous Meningitis

Synonyms.—Tubercular Meningitis—Acute Hydrocephalus (Obsolete), Etc.

History.—Connected with the development of our knowledge of this disease are many honorable names. Whytt of Edinburgh first described "acute hydrocephalus" in 1768. His was a splendid description, but he conferred an unfortunate name. Laennec did much to clear up the pathology, and Trosseau added much to our clinical knowledge. Rilliet and Barthez, the fathers of pediatrics, also contributed classic clinical descriptions.

Etiology.—As the name implies, this disease is due to the invasion of the meninges by the tubercle bacillus, and the consequent formation of tubercles in these structures. In a sense, it is not a disease *per sé*, but is nearly always a part of a more or less general tuberculosis. At any rate, some primary focus is found elsewhere. Nevertheless, meningeal symptoms so dominate the picture, the type of meningitis is so common and so fatal, the clinical picture is so complex, and different cases present such utterly different clinical phenomena,

that the disease deserves separate and serious consideration among nervous affections.

It is far and away the most common form of meningitis. Thus Still, quoting the statistics of the Great Ormond Street Hospital for three years, found 174 cases of tuberculous meningitis, forty-nine cases of epidemic cerebrospinal meningitis and seventeen cases of the suppurative form. The statistics of Holt and others are in close accord with those just quoted.

The disease is not common in infants under six months old. It occurs more often in the second half of the first year, and reaches its greatest incidence in the second and third years of life. After four years it becomes less and less frequent year by year until a "second period of maximum incidence" is reached between the sixteenth and twenty-fifth years. The sexes are equally affected. Like other forms of tuberculosis, it may appear after the infectious diseases, probably from the lighting up of some old latent focus (a tuberculous lymph node, etc.). The diseases that seem to predispose particularly in this way are whooping-cough, measles and typhoid fever. However, we thoroughly agree with Still, Holt, and others, that tuberculous meningitis often attacks seemingly healthy and well-nourished children. The most important etiologic factor is the exposure of the infant or child to some patient, usually some adult with active tuberculosis. In private practice it is astonishing how often one elicits this history. One of us saw a baby, the fifth child in a healthy family, in which the infection could be directly traced to a tuberculous trained nurse. Another baby, studied by one of us, had whooping-cough when exposed to an uncle with phthsis florida. It died three months later of tuberculous meningitis. We could cite many such cases from our personal experiences.

That the milk from tuberculous cattle may also be responsible for this disease, there seems little reason to doubt. In at least two cases of our own this seemed to be the responsible agent. How frequently such infections occur is a mooted question.

Occasionally injury to the head seems to play a causal rather than a mere casual etiologic rôle; just as it does in the production of Pott's disease. In older children, nerve strain, as in preparation for school examinations, etc., seems to act much like physical injury.

Pathology.—From the standpoint of morbid anatomy, we recognize three principal forms of this disease: 1. tuberculous meningitis (miliary tubercles); 2. meningitic gray granulations; 3. tyromata (Taylor). The tubercles, whether miliary or of the larger gray vari-

of cases that in their early stages suggested some gastric disorder. This symptom, if intractible, should always suggest the possibility of the disease under consideration. Constipation is nearly always present. The child's facial aspect is "one of illness and frowning discomfort" (Taylor). Taylor says that convulsions may be observed during this stage; but in our experience they are very rare.

The other stages: Except to redirect attention to the psychic changes which nearly always occur in the order mentioned, we shall make no attempt to divide the further clinical course into stages. With the onset of the disease, we have an accentuation of most of the symptoms noted in the prodromal stage. The face presents what has been well described as a "far away look." There is often a pronounced malar flush. The angles of the mouth are often retracted. Sucking movements and sighing respirations are of common occurrence. The body surface is mostly dry and harsh except just before death, when copious sweats may occur. Local sweating, however, particularly about the head and face is not uncommon, throughout the course of the disease. Such sweating may be unilateral. The "tache cerebral," delayed or of prompt occurrence is a common phenomenon. It is often noted accidentally in palpating or percussing the patient's chest or abdomen. This sign, however, is noted in many other affections. The patient is often found on his side, his thighs flexed upon his abdomen, his legs upon his thighs, in a cramped position (the "position of smallest space"). Head-retraction is not nearly so marked as in epidemic meningitis, and it comes and goes. Some stiffness of the neck is usually present, though, and the chin can rarely be brought downward till it rests on the sternum.[1] The abdomen is always more or less retracted ("scaphoid belly") unless there be tuberculous peritonitis with effusion. The spleen and liver are also moderately enlarged. Percussion of the skull, over the lateral ventricles may elicit marked tympany (Macewen's sign). The hydrocephalic cry, a piercing shriek occurring during the patient's sleep, is often heard; but it may occur in the course of other intracranial affections.

FIG. 65.—POSITION OF THE "SMALLEST SPACE" ("CRAMPED POSITION") IN TUBERCULOUS MENINGITIS.—(*Philadelphia Polyclinic Hospital.*)

[1] Brudzinski's sign represents an important addition to our diagnostic procedures: When one hand is placed on the sternum, the other on the occiput, an attempt to bring the head forward results in flexion of the thighs on the abdomen.

The little patient, often fat and rosy at the beginning of his illness, rapidly emaciates, and toward the end of the disease, shows a tendency to develop bedsores.

The bodily temperature may accord with that of general tuberculosis. Usually, it is not very high; but tends to be normal or even subnormal in the morning and to reach 101°–102° in the evening. In the main, it is lower than in other forms of meningitis. If the patient has been the subject of general tuberculosis, the onset of meningitis tends to lower rather than elevate the fever (Barlow). Hyperpyrexia is a common phenomenon shortly before or shortly following death. Occasionally, as in other forms of tuberculosis we may see the inverted type of temperature (higher in the morning).

FIG. 66.—PTOSIS IN TUBERCULOUS MENINGITIS.—(*Philadelphia General Hospital.*)

The Pulse.—During the prodromal stage the pulse may be irregular and rapid. Later, with phenomena of irritation, it tends to become slow, possibly very slow. Still later, with the onset of coma the pulse becomes soft and rapid.

The Respiration.—This, like the pulse, may exhibit rapidity of rate during the early stage, particularly when the patient is the subject of miliary tuberculosis; but with the advent of irritative symptoms, the rate usually becomes strikingly slow. In one of our patients, the subject of a tyroma, this was a marked phenomenon for many weeks. At this stage and later, respirations are often irregular, showing the "grouped-cerebral" type, or more rarely the true Cheyne-Stokes variety.

Motor Phenomena.—Previously, we have called attention to the stiffness of the nuchæ or the actual retraction of the head. Other phenomena of irritation are sucking movements of the mouth; champing and grinding of the teeth; repeated rhythmic movements of the extremities, some of which are quasi-volitional in character; course tremors; general rigidity of a varying nature, and convulsions. In the later stages of the disease, the extremities are usually stiff in extension:

but the rigidity like the head retraction, is not usually as marked as in other forms of meningitis.

Convulsions, James Taylor says, are usually isolated at the beginning of the disease, localized in its middle period, and general when they occur late. In our experience they are nearly always of late occurrence.

Paresis is universally present throughout the disease; but true paralyses of muscles are not common. A hemiplegia may follow a convulsion, or, prior to death, more widespread paralyses may be noted. Paralyses of cranial nerves, other than the oculo-motor, are also unusual. (See Fig. 66.)

The reflexes vary greatly in different cases and during the course of a given case. Generally, the deep reflexes are increased. Ankle clonus is often present. Kernig's sign is usually obtained in one or both legs; but, as the late Frederick Packard noted, hypotonia may account for its absence. The Babinski phenomenon is usually observed, and may be unilateral or bilateral. The superficial reflexes, on the other hand, are usually diminished, but do not become absent until the patient is profoundly comatose.

Sensory Phenomena.—Early the patient may display both hyperesthesia and hyperalgesia: but late in the disease, cutaneous sensibility is diminished. Hyperakusis too is often observed, the patient being disturbed by sounds as he is by bright light (photophobia).

Ocular Phenomena.—Toward the end of the second week of the disease we may note strabismus, ptosis, and independent movements of the two eyeballs. True nystagmus is not common. At first the pupils are contracted and may show inequality. In the later stages they are dilated, possibly unequally, and are irresponsive to light. The oscillating pupil is of common occurrence.

The Ophthalmoscopic Investigation.—Toward the end of the second week, the ophthalmoscope almost invariably reveals optic neuritis in one or both eye-grounds. This rarely reaches a degree comparable to that attained in brain tumor. Much less frequently choroidal tubercles may be noted; but these may indicate only general tuberculosis.

Contrary to opinions usually maintained, the course of tuberculous meningitis is rapid. Most patients die in from ten to twenty-one days after the first symptoms are evidenced. Rarely, one sees cases of chronic tuberculous meningitis, and occasionally, one sees periods of respite with subsequent return of all symptoms. Probably, some of the former cases are dependent upon tyromata. The latter cases are par-

ticularly sad; because the temporary disappearance of symptoms gives to the parents false hope of recovery.

Diagnosis.—Speaking of the diagnosis of tuberculous meningitis Still says: "In its middle and last stage it is so obvious that a fool cannot err therein; in its beginning so deceptive that the most sagacious physician may fail to recognize that anything serious is amiss with the child." In the early investigation two procedures have stood us in splendid stead: One of these is the sedulous search for tuberculous environment; the other the systematic examination of the little patient for other tuberculous foci. In our experience, dullness over the manubrium, and "stripe dullness" posteriorly have proved of much importance. The Von Pirquet and Moro tuberculin reactions are also most useful; though they tell us only that the patient has tuberculosis, not that he has tuberculous meningitis. The greatest of modern diagnostic procedures is lumbar puncture; for without the aid of any other method it may demonstrate beyond a doubt the existence of this terrible malady. Tuberculous meningitis must be differentiated at times from gastro-intestinal catarrh, pneumonia, typhoid fever, sinus thrombosis, brain abscess, ear disease and other forms of meningitis. We shall not enter into a detailed discussion of these differential diagnoses, for the cerebrospinal fluid carefully studied, usually reveals the truth. Blood studies too (the Widal reaction, leukocytosis in pneumonia and in epidemic meningitis, etc.), may prove of inestimable value. Invaluable as these laboratory methods are, however, they should never wholly supplant such clinical studies as we have striven to describe.

Prognosis.—This is practically hopeless. Some authorities say that recovery in tuberculous meningitis is impossible. There are a few well authenticated recoveries, however. In February, 1904, one of us presented such a patient before the Philadelphia Pediatric Society. He apparently had congenital hydrocephalus. When nine months old, he was having many convulsions and his afternoon temperatures were ranging around 102°. The circumference of his skull was 25 3/4 inches. Lumbar puncture secured us but 6 c.c. of blood-stained fluid—not nearly enough to relieve his intra-cranial pressure. Paracentesis of his left lateral ventricle, however, permitted 23 ounces of fluid to drain away. Much to our surprise the fluid did not reaccumulate rapidly; but three months later 11 ounces of fluid were withdrawn from the same ventricle. Dr. Randolph, in an examination of the centrifugate, found six or seven tubercle bacilli in every microscopic field examined. The patient recovered, though naturally with

an enormous head. He is living at the present day, having passed through some serious illnesses in the interim.

In another case, probably one of tyroma of the cerebellum, symptoms disappeared for two whole months under the administration of tuberculin. They then reappeared in terrible intensity. We shall describe this case in detail in the consideration of brain tumors.

Treatment.—There are few more terrible maladies of early life than the one under consideration. Prophylaxis, however, offers us a wide field of useful activity. That infants and young children should be permitted to come in daily intimate contact with consumptive adults is not excusable either on the ground of maudlin sentimentality or of gross negligence. In the employment of nursery maids especial care should be taken to see that they are not subjects of pulmonary tuberculosis. In the rental of summer homes or of other dwellings, care should also be taken to see that previous occupants were not phthisical. Again, if the milk used for infantile consumption is not derived from tuberculin-tested herds, it should be Pasteurized. Infants and young children should also live the hygienic life, most of it in the open air. Clothing and wraps (Afghans, etc.) when donated, should not be used if they emanate from homes of the tuberculous. If a child has some form of glandular or bone tuberculosis, he should receive in addition to the necessary local measures, proper treatment with tuberculin. The removal of adenoids and large tonsils, and proper attention to carious teeth may be other measures of great preventive value.

The disease once established, the most that we may hope to attain is to lessen suffering; to nourish the patient, and to prevent or control such shocking phenomena as convulsions. Good nursing is the prerequisite of good treatment. Feeding usually presents problems of difficulty. In general the best type of feeding is gavage, through the mouth or through the nasal tube. It is our custom to employ a completely peptonized milk and egg mixture at least three times a day. Rectal alimentation may be tried in conjunction with gavage, but is usually inefficient or totally useless. The bowels are best moved by enemata. Enteroclysis, with normal saline or Ringer's solution, or hypodermoclysis, may do much to atone for the loss of bodily fluids. In the later stages, great care is necessary to prevent the occurrence of bedsores.

The ice-cap probably lessens headache, and should be used unless the patient has a subnormal temperature.

Mercury and the iodides have had their advocates in the past,

but it is highly probable that most of the supposed recoveries from tuberculous meningitis have really been recoveries from some other form of meningitis. Nevertheless, we continue to use mercurial inunctions along the spine. We also employ daily the mustard foot bath or complete mustard bath. For convulsions, the combined use of chloral and the bromides is most efficacious.

For the relief of pressure symptoms, there is no measure equal to lumbar puncture. True, the fluid may reaccumulate rapidly, but there is no adequate objection to the performance of daily punctures. Under certain conditions, as recorded in the mentioned case, we can conceive of ventricular puncture as a justifiable measure. We have employed tuberculin both subcutaneously and in the spinal canal, but so far with no more signal success than in the case mentioned. That was probably a case of tyroma, and in it, the improvement, though remarkable proved but temporary.

Epidemic Meningitis

Synonyms.—Epidemic cerebrospinal Meningitis—meningococcic meningitis—Spotted Fever—Typhus cerebrospinalis (Obsolete)

Definition.—This is a more or less acute infectious disease due to the entrance into the meninges of the diplococcus intra-cellularis meningitidis of Weichselbaum (meningococcus).

Etiology.—Our modern knowledge of this disease dates from 1887, when Weichselbaum made a careful bacteriologic study of six cases. His work attracted little attention, however, until eight years later. At the present time, no one can reasonably doubt that the organism described by him is the direct cause of epidemic meningitis. We shall not enter into a description of this organism, as such may be obtained from any standard work on bacteriology.

Age is an etiologic factor of considerable importance. In general the younger the subject, the more susceptible is he to this dread disease. More children than adults are attacked by it. Seasonal factors appear to be of considerable importance. It is more common in the winter and spring, particularly after a mild winter. In the past, bad hygienic conditions have played no inconsiderable rôle—severe epidemics having occurred in almshouses, barracks, prisons, etc.

Philadelphians recall with pride the noble endeavors of Rush and Franklin during our Revolutionary War, when their city was visited by such an epidemic. Several notable epidemics have occurred in various

parts of the world within recent times—those of 1905 in New York, Boston and Philadelphia being fresh within our memories. During more than a century, sporadic cases have also appeared in most of our large cities. The disease may be said to be always with us in this sporadic form.

The meningococcus has been found in the nasal secretions of nurses and others who have been thrown in close contact with patients suffering from epidemic meningitis. That more cases of the disease do not develop is probably due to the fact that relatively few people are susceptible to it. In Philadelphia, a physician in attendance upon such a patient, developed a rapidly fatal case of this disease. It is highly probable that the meningococcus gains access to the meninges through the nasopharynx.

Pathology.—The work of Klebs, Strümpell, Albrecht, Ghou, Flexner, Royer and others, has placed this upon a firm basis. The most striking find is that of a purulent exudate, unequally distributed over the brain cortex, especially over the parietal lobes and cerebellum (as if "smeared with butter"). Flakes and bands of lymph are noted in affected areas. The pia is always edematous, and the cerebrospinal fluid contains meningococci. When the pyogenic process is more general, the macroscopic appearance is not different from other purulent forms of meningitis. The intensity of the inflammatory process varies greatly in different cases. In one day's sickness pus may have been formed. On the other hand, the purulent process may have been exceeded by those of saturation and hyperemia. Later, the viscid fluid becomes stickier and firmer, and the flaky or band-like distribution marked. After weeks or months, the fluid again becomes more liquid. If death takes place late in the disease, opacities and thickenings may reveal the situations of the former purulent process. Sometimes, however, remarkably little remains to indicate the severity of the inflammation. Chronic hydrocephalus may occur from inflammatory obliteration of the iter or the foramem of Magendie, etc. Indeed, the choroid plexuses and ependyma regularly share in the meningeal inflammation. Less frequently, we encounter encephalitic foci of hemorrhagic and purulent nature. These may result in multiple abscesses of the brain.

In other organs, characteristic changes do not occur. Meningococci are present in the blood, but may be difficult to obtain in cultures or smears. The spleen and liver are acutely congested and enlarged.

Pneumonia is not an uncommon complication. In most cases,

the changes found in the various organs are due to wasting. Metastatic pyogenic processes occur in a fair proportion of cases, however. These may be articular, periarticular, muscular, pleural, endo- or pericardial, a dysenteric like enteritis and nephritis. Of great clinical importance, also, are purulent involvements of the eyes and the labyrinths.

Symptomatology and Clinical Course.—The disease usually strikes like the traditional thunderbolt out of the clear sky. Thus, a beautiful healthy baby one year old was taken out in his coach at

FIG. 67.—EPIDEMIC CEREBRO-SPINAL MENINGITIS IN A NEGRO INFANT, "MODERATE RETRACTION."—(*Philadelphia Polyclinic Hospital.*)

four o'clock in the afternoon. One hour later the frightened nurse brought him back to the house. He was in convulsions, and his temperature was 106°. The sudden onset, with convulsions, vomiting and high fever is accompanied by excruciating pains in the head, back, and extremities. There is usually stiffness of the neck, and head retraction is a marked phenomenon from the first. (See Fig. 67.) Spasticity of the extremities is another early manifestation in most cases. This is usually accompanied by muscular twitching. The pulse and respiration are usually rapid from the first—unlike other forms of meningitis. The face is congested and there is marked vasomotor excitability (dermatographia). Herpes labialis or nasalis appears between the third and sixth days in about 50 per cent. of cases. Petechiæ and purpura also appear in various portions of the

body in a large number of cases, thus accounting for the popular designation "spotted fever." The spleen and liver are demonstrably enlarged to palpation and percussion. The urine is usually high colored and abundant (despite the high fever). It may contain both albumin and sugar. The blood reveals a high leukocytosis of the polymorphonuclear variety (30,000–50,000). Lumbar puncture secures us a cloudy, purulent or blood-stained fluid, with a high albumin content, many polymorphonuclear cells, and diplococci, most of which are intracellular.

We have endeavored to depict the onset, symptoms and signs in a case of moderate severity, but many types of this disease are observed. The principal clinical types are the following:

The ordinary type.
The severe type.
The fulminating type.
The mild type.
The abortive type.
The chronic type.
The relapsing type.
The simple basilar type of Gee and Barlow (?).

The subsequent course of the disease naturally varies in the different types.

In the ordinary variety, the fever remains fairly high for a week or two. It is usually remittent in character. The pulse and respiration rates remain proportionately rapid until late in the disease, when the former may become slow. The feeding problem may prove difficult not only because of the state of consciousness, but also because the head retraction interferes with swallowing. In consequence of this, emaciation proceeds rapidly and may attain a profound degree. The abdomen becomes markedly scaphoid, as in other forms of meningitis, and constipation is a marked symptom. Vomiting may occur at intervals. The motor nervous symptoms remain much as they have been described, unless later motor paralyses occur. The latter may take the form of a hemiplegia, diplegia or monoplegia. The deep or tendon reflexes are increased throughout. The Kernig phenomenon is bilaterally present and the same is true of the Babinski reflex. If the patient remains conscious, his sufferings from headache and other pains mentioned are usually intense. He displays both hyperesthesia and hyperalgesia. Blindness may occur at any time from neuritis or metastatic iridocyclitis. Hypopion may occur, or the pseudoglioma or amaurotic cat's eye may appear. These ocular com-

plications may result in mild as well as in severe cases. Involvements of the hearing mechanism are usually labyrinthine (acute otitis intima). Otitis media occurs less frequently. The state of consciousness varies greatly in different cases. Usually, it is markedly obtunded from the first, and the patient is mildly delirious. In some cases the patients remain conscious to the end, and as we have stated, they suffer terribly.

FIG. 68.—EXTREME HEAD RETRACTION. Simple basilar type of Gee and Barlow.—(*Loaned by James Carmichal, Edinborough.*)

In the severe cases, most of the phenomena described above are accentuated and the patient usually dies in two or three days. Cases of the fulminating type may terminate fatally in from twelve to twenty-four hours, and as in so many of the infectious diseases, may actually present subnormal temperatures. The mild cases, of course, show less intense symptoms than those just described; their courses are shorter, and recoveries are more common. The abortive cases could scarcely be recognized except for the presence of an epidemic. Their subjects suffer headache, backache, etc. They possibly exhibit fever,

vomiting and stiffness of the neck. Then, after several hours, these symptoms suddenly disappear. The chronic cases may extend over many weeks or months. These patients emaciate to a degree that is simply horrible. They tend to die from exhaustion, or to recover terribly crippled with contractures, bereft of sight and hearing, or sadly deficient in mentality. The occurrence of violent relapses leads one to the generalization that the patient with epidemic meningitis is never out of the woods until he is completely out. One of us saw a boy, ill with the disease, who steadily improved, after his first lumbar puncture. This improvement continued without abatement for seven weeks. Then he had a violent outbreak with hyperpyrexia, vomiting and purpura, and died in three days.

We have included the simple basilar form of meningitis under this heading, because Still recovered from the cerebrospinal fluid in this disease an organism that is probably identical with the meningococcus. In this type young infants, usually under one year, are attacked. They exhibit as cardinal symptoms, head retraction of a most extreme degree, vomiting and wasting. The posterior flexion may be so great that the head comes in contact with the buttocks or even with the heels.

The fontanelle becomes tense and bulging, and the head usually enlarges to a marked degree. After the first few days, the protracted course in such a case is usually afebrile. If recovery takes place, after weeks or months of illness, the little patient may be left hydrocephalic or mentally deficient. Some supposed recoveries from tuberculous meningitis have probably been in cases of the simple basilar variety. (See Fig. 68.)

Diagnosis.—This may usually be suspected from the acute onset, the more or less characteristic symptoms (especially head retraction) and the physical and nervous findings. One should never rest satisfied with these mere clinical findings, however; for the blood study reveals the all important leukocytosis and the study of the fluid obtained by lumbar puncture absolutely clinches the diagnosis.

Epidemic meningitis must be distinguished from all other forms of meningeal inflammation. This is done by the methods just mentioned. It must be differentiated, too, from the polioencephalitic form of infantile paralysis. This is best done by the study of the cerebrospinal fluid. If lumbar puncture procures us a cloudy fluid, it should be assumed that the case is one of epidemic meningitis until we know differently.

Prognosis.—Though more recoveries take place in this than in any other forms of meningitis, the toll of death in the past has still been

diminish remarkably in number, and the meningococci gradually disappear. If secondary hydrocephalus occurs, we may well follow Sladen's and Cushing's examples, and inject the curative serum directly into a lateral ventricle. Purulent involvements of joints should be similarly treated. In exceedingly severe cases, it is best to give the second injection of serum twelve hours after the first.

The patient should be treated in a well ventilated but darkened room. Few should have access to this appartment, and noises must be minimized. A water bed is theoretically ideal; but in any case, the patient should be safe guarded against bedsores. What has been said of feeding in tuberculous meningitis, well applies here. The ice-cap also should be employed as in that disease. Morphin and the ice-cap are used to annul the patient's sufferings. The drug should be employed hypodermatically and in sufficient dosage. Incidentally these two measures usually lessen vomiting. Prior to the employment of Flexner's serum, lumbar puncture had afforded a notable advance in the treatment of this disease; but this valuable diagnostic and therapeutic measure has been afforded sufficient description.

Warm baths may prove valuable in the treatment of convulsions, stupor and coma. In chronic cases, the iodides may be tried. Eye complications demand the attention of a skilled specialist. If otitis media occurs, paracentesis should be done promptly. Joint affections require rest and immobilization in addition to the serum therapy just described.

Acute Suppurative Meningitis

Synomyns.—Purulent Menigitis, Vertical Meningitis

Cases are also classified etiologically as pneumococcic meningitis influenzal meningitis, streptococcic meningitis, etc.

Etiology.—The disease may occur at any age, and is no respecter of constitutions. Following Taylor, we may well divide the causes as follows: 1. Certain special causes, such as injury and insolation. Both of these are rare causes. 2. The extensions to the meninges of certain local suppurative processes: Septic affections of the scalp, cranial bones and face (furuncles, anthrax, cellulitis, impetigo, etc.). Septic thrombosis, purulent affections of the nasal cavaties, orbit and ear, are also causative factors of importance. The rupture of a cerebral or cerebellar abscess may result in purulent meningitis. 3. General diseases, such as scarlet fever, measles, smallpox, rheumatic fever,

typhoid fever, influenza and pneumonia, may be accompanied or followed by this form of meningitis.

The purulent process may be due to a single infecting agent, or there may be various mixed infections. The organisms most frequently responsible are streptococci, staphylococci, pneumococci, the bacillus of influenza, the colon bacillus, the typhoid bacillus and the bacillus pyocyaneus.

Pathology.—The process may be a general one, or may be more or less localized in certain areas. The pia is the structure that usually suffers most. Suppurative meningitis may be manifest along the cord, over the brain cortex or within the ventricles. Again, all of these structures may share in a generalized inflammation. When the purulent process is confined to the vertex, or most exaggerating there, certain authorities speak of vertical meningitis. A serofibrinous or purulent fluid is found bathing the affected parts, and possibly distending the pia arachnoid or even the ventricles. Bacteriologic studies reveal the producing organism or organisms. Miscroscopically, we find injection and round-cell infiltration in affected areas.

Symptomatology and Clinical Course.—The invasion of this disease is preceded by some such special, suppurative or systemic process as we have mentioned. The onset itself is abrupt and the course of the disease is short. The patients rarely live more than eight days. The attack is usually ushered in by a severe rigor, which is promptly succeeded by intense headache, vomiting, photophobia and delirium. In two or three days the last named symptom is superseded by profound coma. In babies the fontanelle soon becomes bulging, and in older subjects Macewen's sign is obtainable.* Other symptoms and signs need scarcely be mentioned in detail, as they have been dealt with in the descriptions of tuberculous and epidemic meningitis.

Diagnosis.—The proper diagnosis may be suspected strongly from the history and examination of the patient. Thus, the existence of typhoid fever may occasion a well-grounded suspicion of typhoidal meningitis. Again, middle-ear disease creates the suspicion of a pyogenic process within the cranium. But what has been said of lumbar puncture in other connections, is once more true here. Thus, we have seen tuberculous meningitis appear in the subjects of otitis media. Purulent meningitis must be distinguished not only from other meningitides, but also from cerebral or cerebellar abscess. Sometimes this latter distinction can only be made after trephining

*Tympany or percussion over lateral ventricles, the fontanelle being closed and the patient in a standing or sitting position.

and careful surgical explorations have failed to reveal the presence of a local collection of pus.

Prognosis.—In general, this is very bad. Patients suffering from streptococcic, staphylococcic, pneumococcic and influenzal meningitis nearly all die. Two recoveries from influenzal meningitis have been reported. Recovery may take place in typhoidal infections of the meninges.

Treatment.—Practically, this has proved of no avail. Professor Haynes, of Cornell University, has suggested quite recently a theoretically rational operation. He trephines in the occipital region, exposes the cisterna magnum, and drains from this situation. The procedure seems a justifiable one in these cases. What has been said of nursing, etc., in the treatment of tuberculous meningitis, well applies here. Lumbar puncture, frequently performed, probably affords more relief from headaches and other pressure symptoms than any other form of treatment. Provided appropriate sera or vaccines are procurable their use theoretically appeals to our reason; but barring one influenzal case, we know of no results of an encouraging nature. The disease offers such a gloomy outlook, that a well-grounded suspicion of intracranial abscess justifies us in recommending careful surgical exploration of the cerebellar and temporo-sphenoidal regions. Dr. Randall performed such an operation upon one of our patients. He found no abscess and the subsequent autopsy proved the existence of a streptococcic meningitis; but the patient, far from being harmed by the operation, was temporarily improved by it.

SYPHILITIC MENINGITIS

Etiology.—This affection is by no means a common one. It usually appears in the subjects of congenital lues at about the age of puberty. Exceptionally, it appears at an earlier period of childhood. It is present almost invariably in the juvenile form of general paresis.

Pathology.—The brain membranes exhibit thickenings and adhesions, as may the spinal membranes. We may note also gummatous forms of arteritis and periarteritis. Ependymitis is another fairly common find. Indeed, syphilis may be regarded as an unquestioned cause of many of the so-called cases of congenital hydrocephalus —adhesions resulting in closures of certain portions of the ventricular system.

Symptomatology.—For several reasons, we shall not discuss this thoroughly under this heading. Hydrocephalus may result, and the

symptoms that the patient displays not be distinguishable from those exhibited in hydrocephalus of other origin. Again, in older children, the symptoms may simulate those of brain tumor. Indeed, a gumma may attain such size as to be justly styled a neoplasm (see Brain Tumor). In still another group of cases, no symptoms may be displayed even though autopsies reveal specific meningitis. In the rare juvenile form of paretic dementia, meningeal symptoms may not be noted.

Diagnosis.—The securance of a luetic history, or other evidences of congenital syphilis in the little subject, may lead us to a proper clinical diagnosis. Laboratory studies are of very great aid in this determination. Even when the blood exhibits a negative Wassermann reaction, the spinal fluid may give positive Wassermann and Noguchi reactions. In one of our Blockley cases, the blood proved negative; but a positive Wassermann reaction was obtained from the lumbar puncture fluid. In another a positive luetin reaction was secured.

Prognosis.—In the presence of paresis, the prognosis is absolutely bad. Hydrocephalus, too, usually offers a hopeless outlook, though we have seen one patient recover after lumbar puncture and mixed treatment. Several times we have seen recoveries under specific medication, when active meningeal symptoms have appeared in the subjects of hereditary syphilis.

Treatment.—Until the discovery of salvarsan, mixed treatment represented our best method of dealing with these cases. At the present time mercury and potassium iodide are still remedies of great value. Mercury should be used freely, as the specific, preferably by inunction or hypodermatically. Potassium iodide is employed for the purpose of absorbing formed lesions (gummata). Salvarsan[1] ("606") should be reserved, in our opinion, for cases that remain unimproved under mixed treatment. It should also be employed when the Wassermann reaction remains positive despite active medication with mercury. If hydrocephalus be present or there are pressure symptoms, lumbar punctures may prove of therapeutic value.

Thrombosis of the Cerebral Sinuses

Etiology.—This is a relatively rare affection in early life. The cases observed fall into two groups: 1. The marantic or exhaustive type (Steiner). 2. The inflammatory type. The first form may accompany simple atrophy, the diarrheal diseases, measles, pertussis, etc. From his autopsy experience, Holt avers that this condition is rare in the diarrheal diseases. The shape of the sinus, the direction

[1] Neo-salvarsan has been introduced into therapy since these chapters were written.

in which veins empty into it and the slowness of the blood current (Virchow) are supposed to be the contributing causes to clot formation. According to Marfan, however, bacteria may be found in the marantic as well as in the septic cases. Inflammatory sinus thrombosis (often purulent) is rarer in children than in adults. The most frequent cause of the latter form is disease of the middle ear or labyrinth. Such thrombosis may accompany either septic meningitis or the rarer cerebral or cerebellar abscess. Diseases of the scalp or cranial bones, whether from syphilis, injury, erysipelas, etc., may give rise to infectious thrombosis of a sinus. Diphtheria, scarlet fever, inflammatory eye and nasal diseases, are other affections that occasionally cause it.

Pathology.—Marantic thrombosis most often involves the longitudinal sinus. The same vessel may also be attacked by the inflammatory form in phlegmonous diseases of the scalp, or necrosis of certain cranial bones. In ear disease, the lateral sinus is the one usually affected. The vessel walls are involved in septic thrombosis. When absorption of the infectious material takes place from the throat or nose (diphtheria and scarlet fever) or eye, the cavernous sinus may contain the infected thrombus. The clots, whether firm or laminated, or becoming purulent, must not be confounded with postmortem clots As we have mentioned, meningitis may be found in association with infectious thrombosis or abscesses (pyemic) may be found in the brain or other organs. The lesions of the causative disease may also be observed at autopsy.

Symptomatology and Clinical Course.—It is usually impossible to diagnosticate the existence of marantic thrombosis. Stupor and convulsions may mark the close of the clinical picture, but most often these symptoms are dependant upon some other cause, such as a toxic one. Congestion and cyanosis of the face, dilation of the veins of the scalp and epistaxis may suggest the possibility of a clot in the longitudinal sinus. The existence of a fluctuating temperature, irregular in type and reaching high points, should make one suspicious of the lateral thrombosis, whenever middle-ear disease or mastoid disease is present. If chills also occur, the clinical picture is indeed a suggestive one. When, in addition to these symptoms we have such local phenomena as tenderness of the scalp in the temporal and mastoid regions and the existence of a tense cord-like swelling along the jugular vein, the suspicion of lateral sinus thrombosis becomes well nigh a certainty. In any such case, however, the question should be answered by a skilled otologist; for early operation is necessary for the saving of

life. In thrombosis of the cavernous sinus, exophthalmos, edema of the eyelids and enlargements of the retinal veins are local manifestations of vast importance.

Diagnosis.—The principal diagnostic points have already been considered. The marantic type is rarely diagnosticated; the septic or inflammatory type, in the absence of such local phenomena as we have mentioned, is difficult to differentiate from septic meningitis. The local phenomena when present are of vast value in diagnosis. From cerebral abscess, the differential diagnosis can often be made only at the operation.

Prognosis.—This is most grave in either form—in the first form because of the very nature of its producing causes; in the second because of the severe septic character of the process. In septic thrombosis due to ear disease, early operation may save life.

Treatment.—From the medical standpoint this is principally prophylactic. In exhausting diseases, stimulation and proper food may prevent such a dire occurrence. Prompt recognition and treatment of otitis media or mastoid disease may likewise prevent septic thrombosis. With the latter diagnosis established or even strongly suspected, operation should be urged to save life. According to Körner, statistics furnish 58.4 per cent. of operative recoveries.

Hydrocephalus

This condition, not an uncommon one in early life, is commonly known by lay folk as water on the brain. The "Laird of the North" is said to have suffered from it in his infancy, and the caustic and brilliant Dean Swift died of it at seventy years of age. Its various forms are commonly classified as acute and chronic, internal and external and congenital and acquired. Most of these terms should be dropped from our nomenclature, as they do little to elucidate the subject. Acute hydrocephalus also, a term applied by Whytt to tuberculous meningitis, should be eliminated as obsolete. The relatively small amount of ventricular distention occurring in tuberculous meningitis is in no way comparable to the amount occurring in true internal hydrocephalus. The so-called external hydrocephalus, often accompanied by a small brain or by porencephaly, means but the filling of an empty space with fluid. True hydrocephalus as we ordinarily see it is the internal form. In it the ventricles are greatly distended and filled with a large amount of fluid. It may be congenital or acquired in character. It may also be primary (arising *de novo*)

or secondary (when accompanying brain tumor, or occurring in the wake of epidemic or simple basilar meningitis, etc.).

The ventricular system: According to modern conceptions, cerebrospinal fluid is probably secreted by the choroid plexuses, found in the floors of the lateral ventricles and on the roofs of the third and fourth ventricles. It escapes to the subarachnoidean space and the spinal canal through the following orifices: The foramina of Monro, the anterior and posterior perforated spaces, the iter or aqueduct of Sylvius (third to fourth ventricle), the foramina of Majendie and of Luschka (roof of the fourth ventricle), and the foramen magnum (to the spinal canal).

Reabsorption probably occurs to some extent in the ventricular system. This latter function is thought to be subserved more particularly by the vessels of the Pacchionion bodies and of the membranes generally. There is strong evidence that much of this reabsorption takes place in the theca spinalis. (Foreign bodies, injected high up in the system, are soon found in the neighborhood of the cauda equina; and blood effused beneath the brain membranes is soon recovered in the same locality.)

Etiology.—The influence of heredity is sometimes very potent. We saw a hydrocephalic infant, from a distant city who was the third example of this disease in three successive births. The influence of morbid heredity is again evidenced in the common occurrence of teratologic associates, such as porencephaly, spinabifida, harelip, cleft palate, etc. with hydrocephalus. The disease under discussion rarely occurs in successive generations however, because its subjects are unable to procreate. Syphilis is not a rare cause in congenital cases, as the oft quoted studies of Leon d' Astros well showed. Such was the case in the patient just mentioned as representing the third successive instance of hydrocephalus in one family. In our experience, the disease has twice been noted in one of twins. A history of parental alcoholism is sometimes obtained. A causative rôle is also ascribed to consanguinity. Ependymitis, intra-uterine or of later occurrence, is unquestionably a cause of the hypersecretion in some cases. This may be syphilitic in origin. Whether or not rickets is a cause is a moot question; but our personal experience leads us to answer the question positively and to view hydrocephalus as an occasional accompaniment, if not a direct result of rickets. One disease should not be confounded with the other, however.

In general, tuberculous meningitis has nothing to do with hydrocephalus, but in one of our cases, as we have recorded, the aspirated

ventricular fluid revealed blood and tubercle bacilli. Possibly there was a later implantation of tubercle in this case; for such may occur in true hydrocephalus.

Some cases of this disease follow close in the wake of acute disorders, particularly gastro-intestinal diseases. Traumatism must also be regarded as an occasional cause of the acquired form. No age is exempt from hydrocephalus; but the disease is notably one of early life. Secondary hydrocephalus is dependent upon a blocking of some of the orifices of exit from the ventricular system, or upon sinus thrombosis leading to venous stasis within the ependyma (choroid plexuses), Such affections are brain tumor, epidemic or chronic basilar meningitis. inflammation closing the iter, etc., or rarely sinus thrombosis. A tumor need not involve the ventricular system directly to produce hydrocephalus; it may do so by increasing intra-cranial pressure to such an extent that the cerebellum and bulb are crowded firmly down upon the foramen magnum. (Taylor.)

Pathology.—The large amount of cerebrospinal fluid in the greatly distended ventricles; the thinned out brain (sometimes only miscroscopically visible); the globular skull with its thinned bones and wide sutures, compared by Trosseau to the petals of an open flower; the possible thickening of the ependyma and the enlarged veins of the choroid plexuses; associated teratologic defects, and the named conditions causing secondary hydrocephalus, furnish us with a terse summary of the various finds at autopsy.

The fluid is ordinarily clear, alkaline, rich in salts and contains but a trace of albumin. Its specific gravity usually ranges between 1005 and 1010. Frequently, a pint of fluid is found; but in some cases there is more, much more than this. Bloody fluid, such as we have mentioned, must be rare. In some cases secondary degenerations of the pyramidal tracts and of certain cranial nerves are found.

Symtomatology and Clinical Course.—Hydrocephalus *in utero* may be sufficiently great to prevent delivery. Paracentesis through a fontanelle or even crushing of the enlarged head may be necessary before the baby can be born. Most of the so-called congenital cases, however, appear normal at birth, and the marked enlargement of the head is detected in the early months of life. When the disease occurs in later childhood (acquired form), after the sutures are ossified, enlargement of the skull may be absent. At birth the skull should approximate 14 inches in circumference; at one year of age, 18 or 19 inches. A growth of an inch or more a month should always create grave suspicions; and when the cranial circumference is greater than

that of the chest at two years of age, there is strong evidence of hydrocephalus. We have observed a circumference of 25 3/4 inches at nine months of age, and of 36 inches at two years. (See Fig. 69.)

The shape of the skull is usually globular, its gaping fontanelles and widely open sutures attracting immediate attention. The scalp is stretched and shiny, and the growth of hair is usually markedly deficient. The veins of the scalp are prominent and have been compared to the

FIG. 69.—EXTREME HYDROCEPHALUS UNDERGOING SPONTANEOUS RUPTURE IN THE OCCIPITAL REGION. (Maximum circumference of the skull is 36 inches.) The superficial veins of the forehead and scalp are much distended. The characteristic appearance of the eyes is present.—(*Service of Dr. Babock, The Samaritan Hospital.*)

"caput medusæ," observed on the abdomen in tuberculous peritonitis. The small triangular face forms a striking contrast to the larger, mayhap enormous, head, the undeveloped maxilla often serving to accentuate the disparity. The eyes present a characteristic appearance, pressure upon the orbital plates forces the orbits downward, so that the lower lids partially or wholly conceal the corneæ. The white sclerae only may show between the upper and lower lids. Indeed, the child may

be obliged to pull down the lower lids with his fingers in order that he may see. The facial expression is staring and vacuous.

The auditory canals, too, are often distorted, coming to point straight inward, or even backward.

Nutrition is usually much below par; but we quite agree with Rotch that some patients are large and seemingly well nourished. Such indeed was the case in the baby whose cerebrospinal fluid contained

FIG. 70.—WELL-MARKED HYDROCEPHALUS, (SYPHILITIC)—The child is the progeny of a white mother and a negro father. Syphilodermata are in evidence.—(*Samaritan Hospital.*)

tubercle bacilli. Other bodily defects, occasionally accompanying hydrocephalus, we have already mentioned. We have seen it in association with spinabifida a number of times. We have also encountered indubitable evidence of congenital lues in hydrocephalic subjects (see Fig. 70).

Nervous and Mental Symptoms.—These patients may exhibit numerous motor phenomena. Usually there is spasticity, more marked

in the legs than in the arms. Such spasticity probably represents involvement of the pyramidal tracts (see Pathology). More rarely a flaccid condition of the muscles obtains, or actual flaccid paralysis may succeed the spastic phenomena. The deep reflexes are usually increased. The head is supported badly, as we might anticipate from its size and weight. The child learns to walk late, possibly as late as four or five years of age; or, in other cases, walking is never attained. He may exhibit the typical scissors-gait of cerebral diplegia.

Convulsions are common accompaniments of the disease, and they may be local or general in character. In cases that originate after the fontanelles and sutures have closed, convulsions are liable to appear early and to be severe. In congenital cases it takes a much longer time to damage the brain, and convulsions are often of much later occurrence. The patient of nine months was having three convulsions a day when we first saw him. Nystagmus is seen in a number of patients. It is a phenomenon of irritation, and has been likened by some to the spastic symptoms.

Sensory Phenomena.—Headache is of frequent occurrence and of great severity in the late acquired cases. Accompanied as it often is by optic atrophy and convulsions, a clinical picture results that is highly suggestive of brain tumor. Focal symptoms, however, are usually lacking in these cases. In the congenital cases, and in those acquired early in life, headache is not nearly so liable to occur. If it does, it is less intense. Optic atrophy, as mentioned, is seen in a certain proportion of cases. It is stated, on high authority, that optic neuritis is not necessarily a precursor of such atrophy. Disturbances of vision, even blindness, are also observed in a certain number of patients. Deafness is of rarer occurrence in this disease; but it has been observed.

The Consciousness.—The states of mentality vary from one of normal intelligence to one of marked deficiency. In the main, it is astonishing how much the hydrocephalic brain may be compressed, thinned out and otherwise distorted, without seriously impairing intellection. The late William Pepper frequently mentioned the case of a lady who had been unable to lift her head from the pillow for thirty years. Nevertheless, she was spendidly read and was endowed with such a charming personality that anyone visiting her of an afternoon, would usually find her holding an impromptu reception. In general, the slower the accumulation of fluid, and the younger the child in whom it occurs, the less will be the retarding influence upon intellectual development. Late in the disease, however, hebetude always becomes a

marked symptom, and deepening coma is an invariable precursor of death.

Occasionally the disease reaches a certain stage of development, as it did in Sir Walter Scott's case, and then undergoes spontaneous arrest, but such a fortuitous happening is not to be anticipated. Usually the clinical course is a progressive one, the disease passing more or less rapidly, from bad to worse. When, in a patient affected congenitally. the size of the head increases very rapidly, life rarely lasts more than a year or two. Several times we have seen rupture of the membranes and scalp under just these conditions. The head of such a subject may well be likened to a "bag of bones." The patient may perish from the disease itself or from some intercurrent malady, such as tuberculosis. Hydrocephalus acquired in later childhood, is also a rapidly fatal disease; and death seems an almost welcome relief from horrible suffering when the closed skull is thus resistant to the increased intra-cranial pressure.

Diagnosis.—This should not often present difficulties. The characteristic enlargement of the head, the relatively small size of the face, and the appearance of the eyes, all go to furnish a picture that even laymen may recognize. The shape and the size of the skull are both different from any distortion or enlargement of the cranium observed in uncomplicated rickets. The hydrocephalic head can scarcely be mistaken for the square head, with its prominent bosses, the four-hilled type of skull, the doliocephalic or the asymmetric skulls of rickets. If hydrocephalus accompanies a brain tumor, more or less typical general or focal signs of tumor, have usually preceded the occurrence of the hydrocephalus. These cases may prove difficult, however, particularly if the patient comes under our observation late in the disease. Hydrocephalus in a skull whose sutures are closed may closely simulate brain neoplasm in its symptomatology; but generally it is more rapid in its course than the latter affection. It does not present focal signs.

Prognosis.—For a long life, the outlook is bad, and the congenital cases often die in infancy. The prognosis concerning future intellection and motor ability must be guarded; for many of these patients develop subnormal minds and marked muscular weakness. Occasionally, as mentioned, the disease is spontaneously arrested, and rarely it responds to treatment.

Treatment.—When there is a luetic family history, or when there is a strong suspicion of specific disease, the mother should be subjected to active anti-syphilitic treatment during her pregnancy. Again, evidence of congenital lues in the infant amply justifies the use

of sylphilitic remedies. One patient mentioned by us recovered under such medication. The line of treatment laid out in the discussion of syphilitic meningitis is applicable here. In some cases lumbar puncture affords marked relief from pressure symptoms; and occasionally, cures have resulted from its repeated performance. Our efforts in both directions, however, may be defeated when some portion ot the ventricular system is obliterated. (See Pathology.) Despite current teaching, we have seen ventricular puncture succeed when lumbar puncture failed, and failed for the reason just mentioned. One patient, whose case we have cited, recovered after the second tapping of the ventricle. In the main, however, both lumbar and ventricular punctures afford only temporary relief.[1] Spasms, and other urgent phenomena resulting from increased intracranial pressure, may promptly yield to these measures. Various operative procedures devised for the relief of this condition have to the present time yielded a high mortality and few cures. Nevertheless, we should strongly urge operation in any rapidly advancing case that had failed to respond to other measures, and in which damage to the brain had not been too great. The only rational operative measure advanced and practiced is one that opens a permanent channel between the ventricular system and the subarachnoidean space (Sutherland, Cheyne, Church, etc.).

Intracranial Abscess

This is a rare condition in childhood, particularly if we restrict the term to cerebral abscess. It is very rare in infants under one year of age; but becomes more common between then and puberty. In Gower's collection of 224 cases, only twenty-four occurred in children under ten years of age. Holt collected twenty-seven cases, most of them in infants. Pyogenic collections within the cranium may be extradural, subdural, cerebral or cerebellar. Abscesses in the last two situations may be acute or chronic. We have observed but one case, though several of our youthful patients have been operated upon with the full expectation of encountering such collections.

Etiology.—The causes are well given by Zappert (Pfaundler and Schlossmann) as head injuries, ear disease, affections of the nose or other structures of the head, supuration in distant organs, and general sepsis. We may therefore recognize traumatic, otogenic, rhinogenic and metastatic abscesses. Because of the association of some of these lesions with pneumonia or empyema, the older authorities recognized a "pulmonal" type of cerebral abscess, and the possible connection is

[1] Haynes has had one recovery from "cisterna sinus drainage."

a good one to bear in mind as the case we shall briefly record will show. In our abscence of knowledge concerning the exact causation, we are sometimes obliged to speak of idiopathic abscess.

The organisms ordinarily found in these pus collections are the pneumococcus, streptococcus and staphylococcus. More rarely the colon bacillus, the oidium albicans (in pure cultures), the bacillus pyocyaneus, and according to Fraenkel, the tubercle bacillus have been found.

Pathology.—Abscesses of otogenic origin are most common, and their most usual situations of occurrence are the cerebellum and the temporal lobes. The former situation is by far the more frequent, cerebellar abscesses, according to James Taylor, occurring in children ten times as often as cerebral abscesses. It is sometimes stated that temporal collections of pus are more common complications of middle ear disease; while disease of the mastoid cells is more liable to cause cerebellar abscess. This is certainly not a law, though it may possibly serve as a guiding rule. It is usually easy to explain the occurrence of extradural and subdural collections of pus in the afore-mentioned areas; for there is usually coexistent disease of the adjoining bone; but the explanation of temporal and cerebellar collections, subcortical as they usually are, is not forthcoming. Traumatic abscess usually results at the site of the injury, though contre-coup may be a cause. It is always a single abscess. Disease of the nose(ozena), or of the frontal bones (as in syphilis), usually results in frontal collections. In ulcerative endocarditis, or other septic states, abcesses may be small and multiple.

In the brain, an abscess cavity is usually irregular in contour and contains greenish-yellow, often foul, pus. The surrounding brain-tissue is softened and edematous.

Sinus thrombosis may accompany it. In chronic abscess, encapsulation may ensue, though in some that have lasted for many weeks, no vestige of a capsule has been present.

A cerebral abscess may rupture into a ventricle, or more rarely into the arachnoidean space. The occurrence of meningeal adhesions probably renders the latter form of rupture the more rare. In still rarer instances, spontaneous discharges have taken place through the ear, nose and cranial wound. Even when this takes place, however, the abscess cavity is likely to refill (residual abscess).

Symptomatology and Clinical Course.—Von Bergmann (quoted by Taylor) groups the symptoms in four classes: 1. Those of local suppuration; 2. those due to increased intracranial pressure; 3. localizing signs dependent upon the position of the abscess; 4. those of the termi-

nal extensions of the infectious process. A more usual description deals with: 1. A stage of onset; 2. a latent stage; 3. a terminal stage, in which active symptoms recur and death soon follows.

In extradural and subdural collections of pus, the signs of suppuration and of increased intracranial pressure are predominant. There are few focalizing symptoms. In these cases too, there is rarely a latent period. In cerebral abscess, on the other hand, localizing symptoms may be marked, and those of suppuration and increased pressure few; while the latent period may extend over weeks, months or even years. Curiously enough, abscess is a much more common accompaniment of chronic ear disease or of chronic disease of the nose than it is of acute affections in the same localities.

The Stage of Onset.—Fever and headache, the latter usually severe, mark the onset. The headache is often confined to the same side as the abscess. The fever is usually moderate and continous (Holt); though in certain cases a subnormal temperature obtains, and should create a suspicion of the nature of the process. Delirium, vertigo, vomiting, and cessation of a previous aural discharge may be other suggestive symptoms accompanying the headache and fever.

In the latent or sublatent stage, these symptoms diminish in intensity or disappear for variable lengths of time (in some cases for days or weeks, in others for months or years). Focal symptoms once established, however, remain or advance—sometimes suggesting the existence of a brain-tumor. Such symptoms are mild hemiplegia, convulsive movements of the opposite side, etc., in cerebral abscess, and occipital headache, pronounced vomiting and ataxia in cerebellar collections. The cerebellar symptoms are more liable to be present if the purulent collection is large enough to press upon the "worm." Optic neuritis is common—much more so than in meningitis. Localized tenderness over the scalp may be of great diagnostic value, and may actually furnish evidence of the location of the abscess.

In the terminal stage the symptoms of onset recur in accentuated form and the little patient perishes in a short time.

A Brief Case Report.—The patient was a boy five years old, whose family and personal history yielded little evidence concerning the nature of his malady. Within a few weeks, he had had two falls. After the second one, he developed a left hemiplegia. He was sent to the Samaritan Hospital by Drs. Hancock and West. In addition to his left spastic hemiplegia, we discovered fluid in his left pleural sac. An explorative puncture of the pleura was not made because the level of the fluid subsided rather rapidly.

Symptoms	Abscess	Sinus thrombosis	Meningitis	Tumor
Focal symptoms.	Hemiparesis or hemiplegia; hemiataxia; ocular movements, etc.	Absent.....	Cranial nerve palsies; early spasticity; late paresis or paralysis of one-half or the whole body; retraction.	Often present; vary with the location (see brain tumor); slow advance.
Optic neuritis..	Often present....	Unilateral thrombosis of the central vein of the retina.	Often absent; seen in the tuberculous and epidemic forms.	Usually present, and eventually followed by atrophy.
External cranial signs.	Absent, or tenderness of the scalp.	Edema of the orbit or mastoid region; cervical tenderness and rigidity, with or without thrombosis of the jugular vein; cervical glands swollen; cyanosis of the forehead or distended veins of the scalp; epistaxis.	Absent, except upon percussion (Macewen's sign).	Tenderness over the tumor; sometimes local tympany.
Pyrexia.....	Slight; observed in the stage of onset and the terminal stage; may be subnormal.	Severe—with wide oscillations and rigors.	Marked fever with most forms low or even subnormal in tuberculous meningitis.	Absent.
Pulse.....	Slow; remarkable slowings of the rate at times.	Rapid and small...	Rapid and irregular early; slow in the stage of irritation; rapid and irregular late.	May be slow.
Respiration....	May be slow.....	Usually rapid.....	Grouped cerebral breathing; often slow.	May be unaffected or slowed; marked phenomena in bulbar cases.
Headache.....	Usually present in the early and terminal stages; may be unilateral (on the side of the lesion).	Absent.....	Present in all forms.	Usually present, as a cardinal symptom; may be localized (occipital, frontal, etc.); may be intermittent.
Vomiting.....	Often present....	Not necessarily present.	An important symptom, present early in most types; it may recur at intervals throughout the disease.	A cardinal symptom, particularly in infra-tentorial growths; it is of the projectile type, and may be unaccompanied by nausea.

BRAIN TUMOR IN CHILDREN AND ADULTS.

	Tuberculous		Characters		Sarcoma		Glio-sarcoma		Cysts		Carcinoma		Gumma		Undetermined		Total	
	† C.	ϕ A	C.	A.	C.	A.	C.	A.	C.	A.	C.	A.	C.	A.	C.	A.	C.	A.
Cerebral axis a. Basal ganglia and Lat. Ven.	14	3	3	9	5	8	....	....	1	1	1	2	....	1	3	5	27	34
b. Corpora quadrigemina and peduncles.	16	1	1	2	3	2	....	5	...	...	....	1	...	...	1	7	21	14
c. Pons.....	19	11	10	2	5	1	2	1	1	...	....	2	...	3	1	7	38	17
d. Medulla....	2	11	10	1	...	...	....	....	1	...	2	....	...	...	1	....	6	2
e. Base.....	...	3	....	2	1	3	1	1	1	...	1	....	...	...	4	1	8	9
f. Fourth ventricle	1	...	1	....	1	1	....	....	...	...	1	2	...	...	1	1	5	4
II. Cerebellum..	47	8	1	8	10	13	1	6	9	...	3	....	...	...	11	10	96	45
III. Multiple ...	34	4	15	2	3	5	....	....	2	...	....	2	1	3	3	....	43	17
IV. C. Cortex...	13	9	....	19	1	46	....	8	...	1	1	19	...	13	1	12	21	127
V. Centrum Ovale	6	2	1	11	5	7	1	4	15	...	1	3	1	...	5	14	35	51
	152	41	37	54	34	86	5	25	30	2	10	33	2	20	30	41	300	300

Note: † C.—Children. ϕ A.—Adults.

James Taylor thinks that many tumors of the nervous system are not like those found elsewhere in the body; but are growths *sui generis*. According to him, even tumors containing giant cells do not always caseate or soften, and do not contain tubercle bacilli, Taylor thinks that they may possess a special nature.

Tuberculomata occur nearly as frequently as all other forms taken collectively. "Often they are deeply seated, and have no possible connection with any process of the pia mater." They are often multiple, and are oftener found in the cerebellum than in the cerebrum.

Gummata are very rare in young children. Fibromata, osteomata and angiomata are rare growths developing from the skull or dura mater. Lipoma is the rarest of all brain tumors.

Endothelioma is a fairly common tumor, usually growing from the skull or dura; but sometimes from the brain. It grows somewhat slowly, and is not infiltrating. It is the most vascular of all brain tumors.

Sarcoma is also a relatively common growth (see table). Its forms are more or less peculiar in the brain, and every gradation is seen between pure sarcoma and pure glioma. Next to the tuberculoma, the glioma is the most frequent neoplasm. It is an infiltrating growth, and its favorite situation is the white matter. "It is not very vascular; but is prone to undergo degeneration, softening and even liquefaction. A cyst resulting, hemorrhage is prone to occur into its substance, and is often difficult to recognize from a primary hemorrhage not associated with glioma."

The psammoma is not uncommon. It grows from the leptomeninges, is firm, encapsulated, grows slowly, and contains characteristic concentric bodies (brain sand). "Tumors of the ependyma resemble papilliferous and proliferous adenomata" (Taylor).

Secondary tumors rarely occur, though we have seen invasion of the brain from glioma of the orbit. Sarcoma of the brain may be accompanied by secondary growths in other portions of the brain or of the nervous system.

Hydrocephalus is common, especially when pressure occurs upon some portion of the ventricular system. Other common accompaniments of brain tumors are local congestions, perifocal edema and local changes produced by the action of toxic products.

Symtomatology and Clinical Course.—The symptoms of intracranial growths in adults and children are nearly similar; but in children compensation for a local lesion occurs more readily, convulsions are more frequent and in young children, the affects of increased intracranial pressure are less dire. Differences are also observed because of the greater tendency to infratentorial location of the growth in the child. Every case should be studied clinically from the standpoint of general symptoms and localizing signs: Usually the former appear first; but it should never be forgotten that focal phenomena may appear long before the general symptoms of brain tumor.

General Symptoms.—These are headache, vomiting, optic neuritis (with later atrophy), general convulsions nystagmus, giddiness, mental alterations, hebetude, coma and hydrocephalus (Taylor). Headache, vomiting and optic neuritis may be described as the three cardinal symptoms. Early or late headache is nearly always present. Usually it is not as severe in children as in adults. It is most often general, but may be local, and if combined with local tenderness on palpation or percussion, the local type of headache may be important from the standpoint of brain localization.

Vomiting is of the cerebral type. We have seen a child arouse from

his sleep, vomit, and go right off to sleep again. It may be incited by bodily movements, however, and may be worse when the headache is more severe.

For a detailed description of the more or less characteristic optic neuritis and subsequent atrophy, we must refer the reader to standard works upon opthalmology and neurology. Optic neuritis is rarely absent in children with brain tumors, and no child suspected of the malady should escape skilled ophthalmiscopic study.

General convulsions are common, and if the tumor be supratentorial, may so far proceed in occurrence the other symptoms, as to lead to a diagnosis of idiopathic epilepsy. They may be caused by interference with cerebral circulation, by liberation of toxins (neurin and cholin) incident to tumor growth, and by hydrocephalus.

Giddiness is a frequent symptom which may be constant or paroxysmal. Taylor distinguishes it from vertigo occurring as an important localizing sign.

Nystagmus may be present from the mere existence of a brain tumor, or it may result because of the production of hydrocephalus. It is most common when the cerebellar system is attacked.

Mental changes may be of many different types; usually the amount of change is surprisingly small. Most often there is simply a slowing of mental processes which may later descend into hebetude and final coma; perversity is rare, and mania still more rare. According to Holt and others sleep disturbances are not unusual.

Localizing Signs.—With these we shall deal briefly, calling attention to some generally accepted cardinal signs:

Prefrontal Lobes.—There may be no intellectual changes or scarcely discernible mental alterations. Mental symptoms are commonly present, however (loss of memory, marked mental deficiency, etc). These symptoms are more marked in bilateral lesions. Agraphia may be noted in lesions of the second frontal convolution. Psychomotor aphasia may be present. Epileptiform attacks are common. Tumors of the orbital surface may involve the olfactory tract or the optic nerve, producing on the one hand unilateral or bilateral anosmia, uniocular hemiopia on the other. Other focal signs may arise from pressure on neighboring structures.

Central Convolutions.—Paralysis of voluntary motion on the opposite side of the body (monoplegia, hemiplegia, etc.); hemiparesis, or bilateral paresis (of bilateral coordinating mechanisms); increase of myotatic irritability, with increased tendon reflexes (Babinski, plantar reflex, etc.); slight disturbances of tactile or muscular sense (hemianes-

thesia); disturbances of stereognostic sense; irritative conjugate deviation of the head and eyes, followed by later paralytic deviation; epileptiform seizures, which may be Jacksonian in character though more often they begin locally and become general (the order of "march of the spasm" may be important); aura preceding the convulsions or a pure "sensory fit" (tingling in the arm or leg, etc.), may one or all constitute important focalizing signs. Subsequent exhaustion of a convulsed motor area may be observed. Double crural convulsions or paralysis may occur in lesions of the paracentral lobe, the lobes of the two hemispheres being contiguous on their mesial surfaces.

The gyrus fornicatus (a rare situation for tumors): "Marked sensory impairment of the opposite side of the body, with slight hemiparesis" may be present.

The inferior parietal lobe (comprising the supramarginal and angular gyri): Word blindness; epileptiform seizures preceded by visual aura; crossed amblyopia (impairment of visual acuity and contraction of the visual fields, most marked in the eye of the same side).

Occipital Lobes.—Homonymous hemianopsia; quadrantic hemianopsia; hemichromatopsia; sensory epilepsy or visual aura preceding convulsions; simple lapses of consciousness accompanied by automatism.

Temporal lobes: (Temporosphenoidal lobes) Mental alterations, as in affections of the prefrontal and occipital lobes (unconsciousness with automatism); complete deafness to sounds (bilateral lesions): word deafness (with possible inability to speak and to comprehend written language) in lesions of the left temporal lobes; total loss of language with bilateral lesions, only mimetic expression remaining. In partial lesions, we may observe varying degrees of word deafness, paraphasia and paragraphia. With irritation we may have auditory hallucinations or auditory aura preceding convulsions. If the *uncinate gyrus* be affected, we may note olfactory or gustatory hallucinations, or similar aura preceding epileptiform seizures. In the process of growth the *lenticular nucleus* and *optic thalamus* may be invaded by the tumor, hemiplegia, etc., resulting.

The internal capsule: Hemiplegia; hemianesthesia (never absolute); some degree of hemianopsia. Aphasia does not result, though dysarthria may be present. Irritative symptoms (convulsions, etc.), do not occur as primary symptoms.

The caudate nucleus, lenticular nucleus and optic thalamus: Taylor states that localizing symptoms resulting from lesions of these structures are due to involvement of the internal capsule. Choreiform movements and intention tremor may occur.

Mesencephalon (corpora quadrigemina): Lesions may affect the nuclei of origin of the third and fourth cranial nerves; superior cerebellar peduncles; upper prolongation of the fillet (a sensory bundle); crus cerebri (and close to them the optic tracts); unilateral or bilateral ataxy, with irregular ocular palsies, such as paralysis of the upward and downward movements of the eyes ("Nothnagel's sign"). The Argyll-Robertson pupil may be seen in disease of the anterior pair of the corpora quadrigemina (optic neuritis is often absent); extension of the growth may cause hemiplegia or hemiopia; hemianesthesia to all forms of stimulation; crural hemiplegia (hemiplegia on the opposite side, with oculomotor palsy on the same side); hemianopsia with Wernicke's pupil phenomenon (the pupil does not respond to light thrown on the blind side of the retina); hydrocephalus is common from pressure on the Sylvian aqueduct.

The pons: Paralysis of the sixth nerve; involvement of the fifth nerve (sensory route); and the facial nerve of the same side; pontine hemiplegia (the tongue, arm and leg are paralyzed on the opposite side; the face on the same side, with possible facial anesthesia and atrophy); intense optic neuritis if the tumor occupies the ventral aspect of the pons (this may be absent if the dorsal aspect is involved). Hemianesthesia is never absolute. Paresthesia may occur. Deafness may result from traction on the auditory nerves.

Medulla: Tumors are rare here, and if large usually kill quickly. Growths of the meninges or bone, however, may press upon the bulb. Unilateral or bilateral atrophic paralysis of the lips, tongue, palate, pharynx and larynx, with hemiplegia or diplegia; involvement of the fifth nerve (second and third divisions); hemiataxia (if the inferior cerebellar peduncles be attacked); hypoglossal paralysis on the same side with arm and leg involvement on the opposite side. The spinal accessory nerve, supplying the sternomastoid and trapezius muscles, and the seventh and eight nerves are often implicated. Glycosuria and polyuria may also be present. Hydrocephalus occurred in one of our cases.

Cerebellum.—Localizing symptoms vary at first, being "now present, now absent"; but tend to become more marked and continuous as the disease advances. When there is a suspicion of a cerebellar growth, the scalp should be shaved and the skull carefully examined. Usually, there is an undue prominence on the side of the lesion.

Some of the important symptoms observed are hemiataxia, on the same side as the lesion and more marked in the arm than in the leg; the knee-jerk may vary, even during the day (usually increased); cerebellar inclination of the head (toward the side of the lesion);

cerebellar attitude when standing (the body bent toward the side of the lesion); cerebellar gait (the body bent toward the side of the lesion with a tendency to fall in the same direction); the circus movement (walking in a circle toward the side of the lesion). In lesions of the worm, the subject may tend to fall backward or forward; nystagmus is usually present; the patient in bed may rest in the prone position on the unaffected side; when placed on his back he may be seized with vertigo and vomiting; choke-disc appears early and vomiting is frequent.

Base of the Brain.—Tumors beginning in the bones or other structures at the base, may rupture into the eyes (exophthalmos), nose or pharynx. They cause very violent pain. When they involve the middle fossa, involvement of the eyes is noted early, and associated palsies of several cranial nerves occur. The X-rays may prove helpful in the detection of these growths. Among such growths we must mention tumors of the hypophysis (adenomata), or more rarely psammomata or sarcomata. Growths of the pituitary body may cause bitemporal hemianopsia, obesity and genital hypoplasia. In older subjects, such growths of the hypophysis may be accompaniments of acromegaly. Under such conditions the X-ray may again prove helpful, revealing the enlarged sella-Turcica.

The clinical course of brain tumor is slower in young children than in adults. The bones of the skull separate rather readily and thus prevent the results of increased intra-cranial pressure. The child may live for months or even years, but the disease nearly always tends to a fatal ending. In the presence of syphilitic growths, recovery may take place. Cysticercus cysts may become calcified, and rarely recovery from a tuberculoma may take place.

Diagnosis.—This should comprise: 1. The differentiation of tumor from cerebral abscess, tuberculous or syphilitic meningitis, primary hydrocephalus and hysteria. 2. The localization of the tumor. 3. A diagnosis of the possible nature of the growth.

The general symptoms, particularly vomiting and optic neuritis, here serve us well; while care in the elicitation of the history and in the study of the patient usually enables us to detect more or less suggestive focal symptoms (see the diagnostic table under intra-cranial abscess). Hysteria is rare in early childhood and does not present optic neuritis. On the other hand, it does exhibit its own peculiar stigmata to the observant eye. The student should bear in mind that cerebellar tumor has been confounded with hysteria in not a few cases.

With localization we have already dealt, and shall say nothing more.

The localization of a tumor often helps us to determine its nature (see pathology) and vice versa. The existence of other tuberculous foci and the employment of the various tuberculin tests may serve us well in the detection of a tuberculoma. The positive Wassermann test, or the presence of other luetic lesions, may lead us to diagnosticate syphiloma.

In one of our own recent cases the splendid X-ray study of the chest made by Dr. Pfahler, revealed enlarged bronchial glands, giving us the first positive proof of our diagnosis of a tuberculous intra-cranial growth (tuberculoma of the cerebellum).

Prognosis.—This is nearly always bad. The progress downward is faster in sarcoma and in glioma than in tyroma or some of the rarer benign growths; but the disease nearly always destroys life. Our study will have shown that most brain tumors in early life occur in the cerebellum, pons, etc., situations rather inaccessible to the surgeon. More than this, children stand such serious operations rather badly. Again, tuberculoma is the most common form of tumor, and there may be multiple growths.

Treatment.—Zappert remarks "The treatment of brain tumor is still as hopeless as it ever was." While we are not prepared to go quite as far as he, his statement is still calculated to cause reflection, and to show us how little treatment may avail.

Fresh air treatment, good adequate diet, and tonics may sometimes stay the course of tuberculous growths. A very recent personal experience, that failed eventually, however, impressed us with the apparent value of tuberculin. A boy of three years remained free from symptoms for two months, and during this time, he gained seven pounds in weight.

Potassium iodid and mercury enable us to secure some cures in cases that strongly suggest the presence of syphiloma (gumma); but we must here remark that we may not be dealing with a gumma at all, but with a localized specific meningitis. The drug first named may also afford temporary relief when a tumor is not specific. It should not be given when vomiting is a marked symptom. We have seen it act very badly under these conditions. Acetphenetidin and other products of the coal-tar group may afford much relief from the headache of brain tumor. Bad cases require morphin, however, and it should be used hypodermatically and with a free hand.

Vomiting often ceases when headache is relieved through the intervention of morphin.

Operations have two distinct objects in view. 1. Decompression for relief of pain, optic neuritis and other pressing symptoms. 2.

The removal of the growth. Taylor says: "The prognosis as regards operative measures is best expressed in those statements in which it is customary to approach the friends of the patient: "The patient is suffering from a necessarily fatal malady. If operated upon he will probably never have any more headache or sickness, and these symptoms must continue if he is not operated upon. The operation may save his sight. He may die under the operation—it will very probably hasten death—and he is likely to be mentally reduced and more disabled than at present; but the operation alone holds out a possibility, however small, of recovery, with partial or complete capacity." Operations for purposes of cure are usually contraindicated when the tumor is in an inoperable situation—such as the mesencephalon or the base of the skull. Still we have seen a patient, not a child, operated upon for a glioma of the pons, and at operation there was found a perfectly removable fibro-sarcoma in the space above the pons. Operation for either purpose is dangerous when there is a marked degree of hydrocephalus, as the brain will prolapse when the skull is opened.

The employment of sutures surrounding the scalp incision, and of the Horseley wax for hemorrhage from the bone, have rendered much less dangerous both hemorrhage and its consequent shock. In conclusion, we strongly favor exploratory operations in brain tumor, despite apparent hopelessness; for failing to find a removable growth, the purpose of decompression will still be subserved. We would not willingly advise the shortening of life; but if the operation should hasten the demise, we can scarcely blame ourselves for duty well-performed, nor can we regret that so terrible a malady should have been terminated in a praiseworthy attempt to relieve the sufferer.

Lumbar puncture sometimes affords relief from intra-cranial pressure; but as in meningitis and hydrocephalus it may prove ineffectual because the ventricular system is somewhere obstructed. It is not without danger, as the reduction of intra-cranial pressure may induce hemorrhage into or around the growth, or the bulb may be crowded down into the foramen magnum.

THE CEREBRAL PALSIES OF CHILDHOOD

Synonyms.—Cerebral Spastic Diplegia, Hemiplegia, Paraplegia, Monoplegia, Encephalitis, Porencephaly, Cerebral Agenesia, Little's Disease, Etc.

James Taylor contends, we think with reason, that the hemiplegic and diplegic forms of cerebral paralysis in early life represent distinct

entities: A. Their modes of onset are different. B. Paralysis predominates over rigidity in one form; rigidity or abnormal movements are more in evidence than paralysis in the other. C. One form may occur as a family disease, the other not. D. Gross destruction of brain tissue may occur in one form; wide-spread cellular disintegration in the other.

Hemiplegic forms. (Encephalitis; vascular lesions, and injury.)	Acute encephalitis, causing infantile hemiplega; infantile monoplegia. Marked mental deficiency, with cranial asymmetry. Choreiform hemiparesis. Hemiathetosis.
Diplegic forms, from the deaths of cortical cells.	Generalized rigidity; marked mental deficiency with general rigidity; spastic facial diplegia; family types of mental deficiency, with or without spastic phenomena; bilateral athetosis; choreiform diplegia; epileptiform myoclonus.

Infantile Hemiplegia

Etiology.—Taylor thinks that the majority of cases are due to a disease comparable to poliomyelitis, a disease *sui generis* and peculiar to childhood. That infantile spinal paralysis and polioencephalitis represent but different phases of one and the same disease now seems well-nigh certain (see Poliomyelitis).

The disease may appear anywhere between the first month and the seventh year of life. Its onset is sudden. It also bears a relationship to certain other febrile diseases of childhood, appearing either as a complication or a sequel. We have seen it follow both measles and scarlet fever on a number of occasions. One of our worst cases, leaving a very low state of mentality in its wake, occurred during the course of whooping-cough.

These diseases are viewed as predisposing causes only, reducing the resisting-power of the patient's nervous tissues and opening his system to the invasion of another infection. Some cases are due to various vascular causes; such as thrombosis of cerebral vessels; embolism from endocarditis; rupture of a cerebral vessel, as in pertussus; or meningeal hemorrhage occurring from asphyxia or injury at birth. Two thirds of the cases occur in the first three years of life. A few cases are prenatal in origin. After six years the disease is rare, and cases occurring late are due not to encephalitis, but to vascular lesions (embolism). Freud, in analyzing 594 cases found 76 con-

genital; 162 in the first year, 139 in the second year, 81 in the third, 36 in the fourth, 26 in the fifth, and 75 from the sixth to the tenth year. The sexes are about equally affected; though some say that more cases are observed in males.

Heredity does not seem to play a very important rôle. A history of parental syphilis is fairly common, however, and this disease probably plays a predisposing part in some of the cases of vascular origin. Luetic manifestations are rare in the affected children; though some of them exhibit choroidal atrophy.

The cases seem etiologically separated by their histories relating to the time of occurrence: 1. If developing prior to birth, we look to endarteritis, with thrombosis, possibly resulting from maternal syphilis. 2. If arising during birth we look to asphyxia neonatorum or traumatism from obstetric forceps, etc. 3. Most of the cases occurring after birth and before the seventh year are probably due to encephalitis.

Some other infectious disease appears to bear a causative rather than a causal relationship in about one-third of the cases. Freud and others think that syphilis bears no causal relationship to encephalitis, however. This view stands out in striking contrast to the relationship between syphilis and diplegia.

Pathology.—When postmortem opportunities are afforded, it is usually years after the patient has been stricken. The lesions that are then detected are the following: 1. Circumscribed atrophic sclerosis. 2. Cyst formation. 3. Superficial shrunken patches, resembling "wet wash-leather." (Atrophic sclerosis in the immediate neighborhood.) 4. Porencephaly. Some of these brain lesions are found more often than others, the order in which they are mentioned portraying their frequency of occurrence.

If the patients die early in the disease, the following lesions may be found at autopsy: 1. Acute encephalitis. 2. Thrombosis, either arterial or venous. 3. Hemorrhage. 4. Embolism.

Coexistent with porencephalia, or other late lesions, we may find microgyria, hydrocephalus, spina bifida, etc.

Symptomatology and Clinical Course.—Two-thirds of all cases are ushered in by convulsions and high fever. The convulsions are usually very protracted, a single one often lasting for hours. A boy, twenty months old, seen by one of us with Dr. Major remained convulsed from 3:20 P. M. to 11:00 P. M. The convulsive movements were confined to the right side of his body, and a right hemiplegia succeeded them. In a great many cases, the convulsions occur on the side of the body which shall subsequently exhibit the spastic paralysis.

Sometimes the violent prolonged convulsions rapidly succeed one another, the child eventually dying in one of them. Rarely convulsions are absent. Vomiting is a fairly frequent symptom. Coma may appear early or after several attacks of convulsions.

Hemiplegia may occur soon after the convulsions, or not for a week or more. Freud in an analysis of 692 cases, found 374 right sided and 318 left-sided. The paralysis is at first a flaccid one; but very soon becomes a typical spastic paralysis. The degree of motor disability reaches its maximum between the end of the first and the beginning of the second week. Subsequently it shows signs of improvement, and it may completely disappear. More rarely the initial paralysis remains unimproved.

The distribution of the paralysis: The facial muscles are usually left somewhat weak, the impaired function being especially noticeable in mimetic and emotionable movements. The affected side of the face may be quite expressionless. Occasionally choreiform and athetotic movements are noted in the paralyzed region. Sometimes these irritative phenomena are bilateral, such movements being governed by bilateral

FIG. 71.—HEMIPLEGIA AS A RESULT OF POLIOENCEPHALITIS FOLLOWING SCARLET FEVER. Epileptiform seizures. Dr. Young carried the pronator radii teres through the interosseous membrane, and stitched the muscle to the periosteum on the extensor surface of the ulna. The result was a splendid one from the cosmetic standpoint. A severe convulsion undid the results of his handiwork.—(*Services of Drs. Young and McKee, Woman's College Hospital.*) (*Permission of Dr. James K. Young.*)

coordinating centers. The facial paralysis may not exhibit the same tendency to clear up that it does in adults. The upper extremity is usually more severely paralyzed than the leg, and the paralysis is most marked peripherally. This is not surprising, when we think that so many arm movements, particularly hand and finger movements, are of a trained or educated character. Associated vasomotor palsy is often evidenced, giving to the hand and arm the characteristic red-blue appearance. The extremity is also cold. Stunting of growth is usual, the arm seldom attaining the length and caliber of its fellow of the opposite side. Abnormal movements are also more common here than in either the leg or face. Contractures appear early. The upper arm is adducted, the elbow sometimes coming part-way across the trunk. The forearm is flexed at a right angle to the arm and is semipronated. The hand is flexed at the wrist and deviated toward the ulnar side. The thumb is adducted and flexed into the palm and the fingers are closed over it. In general, the leg is less affected than the arm; but what paralysis there is, is again most marked toward the periphery. The extremity often occupies the so-called "rest position," rotated inward and flexed at the hip, and flexed at the knee. The foot is dropped and presents pes cavus. The toes are extended at right angles to the metatarsal bones or are strongly flexed. (See Fig. 71.) Movements of an abnormal character are less frequently present in the leg than in the arm.

The patient's gait resembles that of an adult hemiplegic. Notwithstanding the marked contractures in the paralyzed parts, the affected members may be astonishingly useful.

The deep reflexes may be lost at first; but are almost always much exaggerated later on. The knee-jerk may be actually clonic in character. Ankle-clonus is often but not always present. The plantar reflex is usually of the extensor type (Babinski). A number of other more or less characteristic reflexes may be obtained in the upper and lower extremities, (exaggerated bicipital, tricipital, flexor and extensor jerks; Gower's reflex; tendo-achilles jerk; the Gordon reflex, etc.).

After the symptoms of onset have disappeared, the sphincters are found unaffected; unless mentality is left at so low an ebb as to impair conscious urination or defecation.

Hemianopsia is not uncommon, and it may be either transient or permanent. When permanent, the child habitually holds his head on one side. Hemianesthesia is about as freqeunt as it is in adults with hemiplegia. One of our little patients burned himself badly on the

steam-pipe of a heated trolley car. He was wholly unconscious of the happening, and the burn was discovered by his attendant. Even when made aware of his danger the boy could not be induced to occupy a seat next to the aisle and away from the offending pipes.

Aphasia, when present is different from the aphasia of adults, and in general offers a better outlook. The left Broca's region (propositional speech center) has not attained the dominant influence that it attains in later life. In 324 hemiplegics with speech disorders, 200 exhibited right-sided paralysis; and 124, paralysis of the left side. Possibly some members of the latter group were congenitally left-handed.

Post-hemiplegic Disorders of Movements.—These may be divided into two major groups: 1. abnormal movements accompanying voluntary movements. 2. Spontaneous involuntary movements. Of the first group rigidity, ataxia and athetoid movements are examples. Post-hemiplegic chorea and post-hemiplegic tremor are the movements unassociated with volitional muscular activities. All such movements, whether accompanying voluntary activities or not are of bad prognostic omen. They not only interfere materially with efforts at manual training; but they also tend to become progressively worse. Athetoid movements—"slow lasting rhythmic movement, which may be likened to the movement of the octupus"—are usually best exhibited in the fingers and hand. They here take the form of alternate slow flexions and extensions when the patient makes some voluntary effort. When observed in the face, they tend to affect its lower portion.

Trophic Disturbances.—These may affect the soft parts, and also both joints and bones. The atrophy is really of a double nature—the initial wasting of the part and the later retardation or arrest of development.

Deformity of the skull is not rare in the infantile hemiplegic. This may represent adaptation of the bone to the shrunken brain. Thus we may observe marked flatening of the skull over a porencephalic area. Such asymmetry, while not a constant phenomenon, is always suggestive. The face may participate in the asymmetric development, both the eye and ear being smaller than the corresponding members of the opposite side. One-half of the trunk too, may be smaller than the other, resulting in scoliosis. Attention has been called to the blueness and coldness of affected parts. Various affects on bone and joint structures may result from the play of contractured muscles. Rarely fat hypertrophy may appear in paralyzed parts, and actual muscular hypertrophy may result from morbid movements. Muscular atrophy

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in hemiplegia does not result from disuse but from the absence of proper cerebral innervation.

Epileptiform attacks.—These occur more or less frequently, in about one-half of the patients. Usually they are not so severe as those of idiopathic epilepsy. Some female hemiplegics exhibit such attacks only at the approach or appearance of the menstrual period. Coma and automatism are not often seen in association with these epileptiform seizures.

Diagnosis.—The occurrence of convulsive seizures, severe and protracted in type; the early existence of high fever; the subsequent unilateral paralysis, flaccid at first and spastic later on; all go to form a fairly definite symptom-complex. Early, such cases must be distinguished from the specific fevers; from infantile eclampsia and from meningitis. Despite frequent assertions to the contrary, we do not find the specific febrile disease of childhood often ushered in by convulsions; unless indeed the patient has previously exhibited a convulsive tendency. When the onset of one or the other of these diseases is suspected, however, one must occasionally suspend judgment until more definite phenomena appear or fail to appear (the eruption of scarlet fever, etc.).

In infantile eclampsia one expects to find both underlying causes (such as rickets) and reflex exciting causes (intestinal disturbances, etc.). Lumbar puncture comes to our aid in differentiating between this disease and meningitis.

Formerly it was the custom to differentiate at length between infantile spinal paralysis and the affections under consideration, but recent studies have shown how closely encephalitis and poliomyelitis may be associated. Of course in the typical paralysis of spinal origin we have all of the signs of involvement of the lower neuron (a flaccid paralysis, absent knee-jerks, etc.). Again in the typical cerebral paralysis, we have all of the phenomena of involvement of the upper neuron—such as we have just described. But some cases of poliomyelitis are ushered in by violent cerebral symptoms, and some cases of cerebral hemiplegia appear during epidemics of poliomyelitis. There is little doubt that the two conditions are closely associated.

Prognosis.—Barring the few cases that die early during the violent convulsive period, few deaths occur in the early stages of infantile cerebral hemiplegia. When the patients remain paralyzed and mentally deficient they are more prone to die from intercurrent maladies than normal children. The question of future bodily usefulness time alone can decide, but nearly always marked improvement in motor ability takes place unless such development is handicapped by the existence

of abnormal movements. The liability to epileptiform attacks (50 per cent. of cases) must ever be borne in mind and the prognosis correspondingly guarded to puberty or even beyond. Mental acuity is likely to remain somewhat below the normal, though some patients develop wonderfully in this respect. The unfavorable prognostic import of abnormal movements has been sufficiently accentuated.

Treatment.—This may be considered from two standpoints—namely, treatment during the early convulsive period and later therapeutic measures; when paralysis, etc., have become established.

Early Treatment.—If the child is seen in the convulsive stage of the disease he should be promptly chloroformed. This drug promptly removes the excited cells from the field of abnormal activity. More than this it lowers blood pressure not only through its direct action, but also by causing a cessation of convulsions. Again, the fact of having the patient under the influence of an anesthetic better enables us to carry out other therapeutic measures. Thus, if the fever is very high, we may reduce it by means of colonic lavage with cold (even ice cold) normal salt solution. We may also give a hot mustard bath while the patient is relaxed. The sedative influence of the chloroform may be aided and prolonged by giving the patient an enema containing sodium bromide (gr. 5 to 10) and chloralhydrate (gr. 1 to 5). This is best given in starch water (see treatment of convulsions). Repetition of the convulsive seizures may demand that this treatment be repeated. If the seizures are not readily controlled by these measures, morphin should be given hypodermatically. The question of nourishment may be left in abeyance, even for several days, but water should be given freely by mouth and by rectum.

Later Treatment.—This aims to do several things: 1. To prevent the bad effects of rigidity; 2. to establish as much voluntary control of affected muscles as possible; 3. education, if necessary special education, for the development of the patient's mentality; 4. treatment of the later epileptiform attacks.

Massage and passive exercises may accomplish much if properly utilized. They should aim from an early period to develop the usefulness and improve the nutrition of the paralyzed muscles, not of their healthy antagonists. Indeed, misdirected efforts along these lines may serve to exaggerate contractures rather than to prevent them. Woolen garments should be worn by the patient, because of the lowered temperature of the paralyzed parts. Hydrotherapy, particularly the employment of alternate hot and cold douching, may serve to raise the vitality of these affected members. Passive hyperemia (Bier) may

blood-vessels, and this vascular evidence remains, revealing the n
of the initial process.

The cell degeneration is usually a primary one, and the neuro
changes follow.

Symptomatology and Clinical Course.—The disease is us
noted at birth, or as soon afterward as the infant exhibits acti

FIG. 72.—DIPLEGIA (PROBABLY HEMORRHAGIC, AND A RESULT OF ASPHYXIA N
TORUM.—(*Philadelphia General Hospital.*)

which reveal the stiffness and clumsiness. In less severe cases, ev
the congenital variety, the disease is not noted until the period whe
child should begin to walk. Sach's amaurotic family idiocy ap
during the first year of life; while family diplegias usually make
appearances between six years and puberty.

Of the birth cases, more males are affected, particularly the l
boys, but barring these cases, the sexes are equally affected (Ta

The symptoms usually displayed, in combinations of varying degree. are muscular rigidity, paresis, perverse movements, contractures, increased deep reflexes, and mental deficiency. Some cases exhibit optic atrophy, ocular palsies and bulbar paresis. Epileptiform seizures occur in about one-half of the cases.

The rigidity is usually more marked than weakness. The lower extremities are most affected in the majority of instances. The arms are

IG. 73.—THE SAME PATIENT AS FIG. 72, SHOWING THE BILATERAL SPASTICITY. This ent is steadily improving in motor coördination and mentality.—(*Philadelphia General spital.*)

s affected and the face least of all. The gait is digitigrade, the knees pressed together, and sometimes there is cross-legged progression issors-gait). The general rigidity is so marked in some cases that assumption of the sitting position is impossible.

Mental System.—One may observe every degree of mental deiency in diplegic patients, varying from very slight impairments of

intelligence to a state of mentality that reduce the victims to a condition of helpless automatism. As a rule the mental state is a placid one, and generally the degree of mental impairment is not proportionate to the amount of rigidity, nor are the patients as dull as their facial expressions would lead one to anticipate. Speech defects, such as late acquirement, slowness of expression with overaction of the facial muscles, slurring and stammering, are all of rather frequent occurrence. If the disease occurs rather late in the child life, speech may be lost. Taylor states that the cry of these children may be very characteristic; "they give vent to a series of hoarse prolonged roars very unlike the scream, sobbing and broken respirations of a normal child."

As we have stated, about 50 per cent. of diplegics have epileptiform convulsions; but these tend to occur less frequently in the patients with bilateral choreiform and athetoid movements.

Occasionally we find a primary optic atrophy. Other cranial nerves may be affected, producing inequality of the pupils and slowness of light reaction; spontaneous nystagmus; convergent strabismus (in about one-third of cases). More rarely there is divergent strabismus. The face, while less affected than the leg and arm, usually shows both paresis and rigidity, with general loss of emotional expression (the mask expression). Slobbering is common. On the other hand, overaction of the facial muscles is noted in a few cases. Difficulty in deglutition is sometimes noted ("Infantile pseudobulbar palsy"—Oppenheim). Still more rarely we have disturbances of the larynx.

Conformation of the Skull.—There is some degree of microcephaly in most of the congenital cases (false microcephalus). Asymmetry and flattenings in the regions of the central convolutions are common.

Attitude.—The head may be retracted; but more commonly falls forward. At times there is torticolis. The spine may exhibit lordosis, kyphosis, or scoliosis. Very characteristic are the "cramped attitude," the "attitude of adoration," and the "extension-supination attitude." Common orthopedic conditions are pes cavus, talipes equino-varus, genu recurvatum, etc. Certain perverse movements observed in these patients are maladroitness of movement, facial overaction and grimacy, chorea, athetosis and intention tremor. Common sensation and muscular sense are usually unimpaired; though one of our patient's laughed when given an injection of antitoxin. Most of these patients are short-lived, relatively few of them living far into the third decade.

Diagnosis.—Usually this presents little difficulty. Paraplegic rigidity of cerebral origin may be confounded with spastic paraplegia arising from other causes. Thus it must be distinguished from the

paraplegia of spinal caries. Certain cases of pontine tumor may exhibit symptoms suggestive of the conditions under consideration; but in addition they usually have headache, vomiting and optic neuritis. With any care in diagnosis it would be difficult indeed to confound either hydrocephalus or meningitis with infantile cerebral diplegia. Disseminated sclerosis, a very rare disease in childhood, invariably progresses from bad to worse; while diplegias remain stationary or tend to show marked improvement. In Friedreich's ataxia, the knee-jerks are absent, not increased. Juvenile general paralysis exhibits its characteristic pupils, its ataxy, its absent knee-jerks and its evidences of congenital syphilis.

Prognosis.—Most of the patients are short-lived. In infancy they tend to die of marasmus or of broncho-pneumonia. Progressive cases, while relatively rare do occur, and such may perish in two years time (see amaurotic family idiocy). Concerning the patient's eventual mental caliber and future physical usefulness, the prognosis should be guarded. We have in mind too, a little girl who has sold flowers for years on one of our principal thoroughfares.

Treatment.—We shall not describe this here, as it has been considered under infantile hemiplegia and will be further considered in the chapters dealing with mental deficiency.

MENTAL DEFICIENCY

This term, or the designation *subnormal* as applied by Shuttleworth, seems to us so much more expressive and so much less offensive than the terms idiocy and imbecility, that it will be used generically to indicate all mental states that fall below average or normal standards.

Mental deficiency bears much the same relationship to early life that insanity does to adult existence. Insanity, however, is a disease that is usually implanted upon the more or less mature brain; while mental deficiency results from interference with or retardation of the brain development. The latter result is usually evident in both body and mind. Marked deficiency, such as we often see in Cretins or in microcephalus, can be recognized by anyone; but to determine the slighter grades of deficiency, seen in backward school children and in some juvenile offenders, some knowledge of normal development through the different periods of the child-life must be possessed by the examiner. Such knowledge we cannot elucidate at length in a work of this character. It must include not only an acquaintance with normal physical develop-

ment (weight, height, symmetry, etc.), a knowledge of motor phenomena, such as holding the head erect, sitting, walking and the later more coordinate acts; an understanding of the development of the senses, a knowledge of mental development, with special reference to the acquisition and perfection of speech, and also of memory, the emotions, moods, ideas, association of ideas, reason, etc.

All present classifications portraying the various types of mental deficiency are open to criticism; but in our opinion, Ireland, Shuttleworth, and others are perfectly correct in adopting clinico-pathologic bases for their classifications. These seem most scientific in method, and prove most useful in practice. The following classification, largely founded upon those of the authors mentioned, has been advanced by one of us and has proved of inestimable service in our hospital and private work and at the "Bancroft Training School at Haddonfield, N. J."

Types of Mental Deficiency:

1. Microcephalus.
2. Macrocephalus; usually synonymous with hydrocephalus; but occasionally dependent upon undue thickness of the cranial bones, or upon an actual hyperplasia of brain tissue.
3. Cretinism and allied states.
4. Mongolianism.
5. Mental deficiency dependent upon inflammatory disease of the brain and its membranes (encephalitis and meningitis).
6. Mental deficiency dependent upon blood-vascular conditions. (Hemorrhage, thrombosis and embolism.)
7. Traumatic cases.
8. Syphilis.
9. Epileptic types.
10. Mental deficiency arising through innutrition.
11. The primarily neurotic.
12. Mental deficiency through deprivation.
13. Family or familial types.
14. Morally deficient children.
15. Backward children.

Attempts at classification have been made from many different points of view: Ethnologic, pedagogic, psychologic, etc.; but no such classification is perfectly satisfactory. The physician, at any rate, must work from the clinico-pathologic viewpoint: Psychologically, the cretin is ranked as an idiot; pedagogically, he is styled low grade—much lower than the Mongolian. Clinically, however, a proper diagnosis leads to thyroid medication. He promptly rises to a much higher men-

tal and physical plane. From the psychologic standpoint, the Binet system of tests promises very much; but the reader is referred to the work of Goddard (Vineland), to Cornell's "Health and Medical Inspection of School Children," etc., for such information.

Some cases may seem to fall under several divisions of this classification; but a little experience enables us to place nearly every one in his appropriate place.

1. MICROCEPHALUS

This is a morbid condition in which the brain ceases to grow at its proper rate, and does not attain its normal size. The striking result is a small and characteristically shaped head, and this is usually accompanied by more or less interference with mental and bodily development.

Etiology.—Neurosis and psychosis stand at the head of the list as hereditary causes of this condition. Many of the microcephalic children in our state institutions possess mentally deficient, epileptic, criminal or insane parents. A history of parental alcoholism is sometimes obtained. We have gleaned it in not a few cases. Inherited syphilis is also present at times, and the affected subject may show indubitable evidence of this disease. Again, several members of one generation may be microcephalic. Two brothers in the State Custodial Institution at Rome, N. Y. are wonderful examples of this truth. Intra-uterine conditions may be of etiologic importance, though these are more likely to result in false microcephalus. In some instances, maternal impressions have been invoked (see Barr) to account for the condition. Birth or extra-uterine cerebral hemorrhage, poliencephalitis, etc., may result in the failure of certain portions of the brain and skull to attain normal dimensions. In such cases, the skulls are not usually symmetric and they do not possess the shape of the typical microcephalic crania.

Pathology.—Many authorities very properly differentiate between true and false microcephalus. In the true form, there is arrest of cerebral development, or at least a marked retardation of it. This may be confined to the frontal lobes or may involve the whole brain cortex. Microscopically there is agenesis corticalis, at least in affected areas. In false microcephalus we have some gross anomaly of the brain, such as porencephaly, etc. In certain rare instances the skull may be of normal size, or even large. In such cases, there is an excess of cerebrospinal fluid in the subarachnoidean space. (See Hydro-

cephalus.) The typical microcephalic skull is not only small, but its bones are very thick, and the fontanelles and sutures are closed at an unduly early age.

Symptomatology and Clinical Course.—The head of the typical microcephal is not only small but possesses a characteristic shape. It is deficient in its transverse diameter and is also brachycephalic. The forehead is sloping, and often exhibits a prominent frontal suture

FIG. 74.—CONGENITAL MENTAL DEFICIENCY OF A LOW GRADE, THE RESULT OF A GROSS BRAIN LESION. (Probably thrombotic, and a result of hereditary syphilis. Degenerate ear—"Moral" ear.—(*Philadelphia Polyclinic Hospital.*)

or ridge; while the posterior parietal and occipital regions are also flattened. Thus the vertex comes to a characteristic apex. The bones of the face are usually of normal size, in direct contrast to hydrocephalus: The resulting disproportion between the skull and the face give rise to the so-called "bird-face" appearance. The body height is usually less than normal, but it may attain the normal point or even become excessive. The head is often carried forward upon the relatively long slender neck, and there is a marked dorsal rounded-kyphosis. The chest is flat and ill-developed, with rounded shoulders,

that is, with the shoulder girdle falling far forward. The limbs are long, slender and often singularly graceful, and the same description applies to the fingers. The position of the body frequently permits the long arms to fall forward in standing or walking, suggesting to many the appearance of the anthropoids. Nervous phenomena: From the motor standpoint we have two types of microcephalic children. There is either marked motor weakness with actual inability to support the head—and this may be exhibited in various degrees—or else the children are restless, active and noisy, exhibiting many rhythmic automatic acts. Of the latter type were the so-called "Aztec children" which many members of our present generation will recall as exhibited in Barnum's Circus. Cases exhibiting spasticity, diplegia, hemiplegia, choreiform movements, athetosis, should not be classified with cases of true microcephalus (Imbraham). They are examples of false microcephalus.

As a rule, there are no marked disorders of sensation; though the child's mentality may be so low that it is well-nigh impossible to attract his visual or auditory attention, and he may prove insensitive to pain. The intellect shows different grades of impairment in different cases; but there is usually marked deficiency. Some of the most hopeless, helpless cases that we see are of this type. On the other hand, it is surprising how much some of these children can learn, and the degree of intelligence is not always proportionate to the size of the head. One of the brothers at Rome[1] has such a small head that one is simply astonished at his voice and vocabulary. Very recently, one of us watched such a child engaged in plaiting a hammock, and in doing some basket work. He made no mistakes. This same boy talks very well though in a somewhat effeminate voice. Some of these children exhibit mischievous, perverse and incorrigible tendencies.

Diagnosis.—This should admit of no mistake. The somatic, nervous and mental symptoms exhibited by these children go to make up a clearly defined clinical picture. With care, even the false microcephalus can readily be distinguished from the true disease. The trouble is that medical men in general know little or nothing of the various types of mentally deficient children; nor are they interested in them. The curious part of this attitude is that though great interest may be displayed in some patient with locomotor ataxia or in some incurable paretic dement, very little interest will be manifested in the diagnosis of children mentally deficient. These children are intensely interesting, and more than repay any effort spent in studying them.

[1] "Custodial Institution," Rome, N. Y.

Prognosis.—Microcephalic children are often very delicate, and are prone to develop pulmonary tuberculosis and pneumonia. They are usually short-lived, some perishing in infancy and some dying during the first decade of life of the diseases mentioned. In the microcephal of the physically helpless and mentally apathetic type, one naturally expects less improvement in body and mind than in the more restless active type; but work with mentally deficient children constantly teaches us that we never know how much may be accomplished by training until we try.

Treatment.—This should include good hygiene, careful shielding from infectious diseases, and not rarely medicinal treatment with drugs. Training to be successful and complete had best be carried out in a suitable institution, and by a suitable one we mean one where the spirit of optimism ever dominates, tempered by sound judgment of the individual child's capabilities and of his particular needs. The training includes sense training, motor training and intellectual training.

Lannelongue's procedure, linear craniectomy, was founded upon a false conception; that the small brain was due to premature ossification, rather than the reverse. It has been practically abandoned. Nevertheless, if there is evidence of increased intra-cranial pressure, linear craniectomy may still be tried. We have studied one boy who was clearly helped by it.

2. Hydrocephalus

This subject has been fully dealt with elsewhere. In the present classification we include only the cases attended by mental deficiency.

3. Cretinism

This is a bodily state dependent upon absence of or disease of (usually goiter) the thyroid gland. Cretinism exhibits such marked and characteristic bodily and mental phenomena that one acquainted with the disease recognizes the subject of it at a glance. One of our assistants made the diagnosis as a little cretin was carried down the stairs to the hospital dispensary. The disease was known to the Ancients, the elder Pliny probably recognizing it as it occurred in goitrous subjects. Wolfgang von Hofer, Court Physician of Austria, referred to it in the seventeenth century. The first scientific study of cretinism, and the first noble effort to aid its subjects was made by

Gugenbuhl in 1847. (Barr.) The studies of Schiff, Horsely, Bramwell and Osler, etc., have placed our clinical knowledge of cretinism upon very sure foundations.

Etiology.—There are two distinct types of cretinism, the endemic and the sporadic. The former type is observed in regions where goiter prevails—the Austrian Tyrol, Switzerland, the Balkans, the Pyrenees, etc. It occurs chiefly in the valleys of these mountainous districts. Kocher of Bern believes that some infectious agent is conveyed to the victims through the waters of these regions. Formerly, this was thought to be lime. Cretinism may appear in the children of goitrous parents, and the cretin may himself exhibit a goiter. Endemic cases are not so easy to explain. The afflicted child may appear in an otherwise healthy family. The thyroid gland may be absent from the first, but symptoms of cretinism are rarely present at birth. Far more frequently, the child does not show symptoms for several months, or even for a year or more. The occurrence of symptoms after some acute disease may lead us to suspect thyroiditis, with subsequent athyroidea or hypothyroidea. Syphilis may cause a specific thyroiditis.

Pathology.—The essential pathology is found in the thyroid gland and in the subcutaneous tissues. The thyroid is either absent or diseased, and the most common disease is goiter. The condition of the subcutaneous tissues is the well-known one of myxedema. This is especially marked in the neighborhood of the eyes (edematous), the supraclavicular regions, the mammary regions, the suprapubic tissues, etc. (the so-called "pads of fat"). The bones undergo very late ossification, and the subject is markedly dwarfed. The remaining pathology may be noted in the living subject.

Symptomatology and Clinical Course.—As already mentioned, the subject of this disease may appear perfectly normal when born; but in a short time, usually several months, he begins to present the following picture:

He ceases to advance in height and weight, and later exhibits marked dwarfism. Cretins are generally somewhere between 3 and 4 feet high when they attain adult existence. The skull is usually normal in size, though it may be large or assymmetric. The scalp is surmounted by scanty, coarse, dry hair. The eyes are far separated, and the lids so puffy (myxedematous) that the upper and lower ones approximate or even meet. The nose is broad and flat, and has been described as snout-like (prognathous). The face is pale, with a peculiar pallor (putty color) and this obtains over the whole skin surface. Facial eczema of the dry variety is common. The expression of the

FIG. 76.—CRETINISM OF A MILD GRADE ("CRETINOID"). The patient is shown in some remarkable poses. The bowing of the lower leg, to which we have called attention, is very marked. We have never failed to observe this in a cretin.—(*Courtesy of Dr. Harry Carey.*)

The latter cases are well designated "cretinoid" (see Fig. 76). Some cases of infantilism, while not similar clinically to cretinism, have an origin comparable to it, being dependent upon hypothyroidea. Like the cretins and the cretinoids, they too may be markedly helped by the administration of thyroid gland.

Diagnosis.—Cretinism presents no diagnostic difficulties. If it did, they would be promptly removed by the therapeutic test, administration of desiccated thyroid. That Mongolianism is sometimes confused with cretinism is due to the fact that the latter disease has possessed the imagination of the medical man, and that the more common and equally characteristic Mongolian type is not known to him. Roentgenograms of cretins exhibit the characteristic delay of ossification.

Prognosis.—This is dependent upon a number of factors. Untreated, the cretin will not improve and will probably be short-lived. The earlier in life his condition is recognized and treated, the better will be the eventual results. Nevertheless, old cretins sometimes show astonishing improvements in physique when thyroid is given them. Many patients improve physically to a notable degree; but their intellects remain far below the normal. Under our care, one such child brightened intellectually, it is true; but she became noisy, destructive and incorrigible. This case impresses a useful lesson. Thyroid therapy must be continued through the life of the subject.

Treatment.—This must be approached from two standpoints: 1. The specific therapy. 2. Special training for the patient, especially when treatment is started late.

The specific treatment, administration of thyroid gland, has been so well exploited in many monographs, that we need say little more here. Surgery, at its best, presents few results so theatric as the somatic and mental transformations that thyroid treatment induces in cretinism. We begin treatment by giving one grain of desiccated gland three times a day. Every third day another grain is added to the day's dosage, until the patient is taking six grains in the twenty-four hours. Very few patients require more than this. On the other hand, we have seldom seen bad results from such dosage.

Hyperthyroidism may evidence itself in fever, rapid loss of weight, palpitation, syncopal seizures, nausea, diarrhea, etc. Rarely sugar or albumin may appear in the urine.

We believe that the future will bring forth some reliable operation designed to transplant into cretins the thyroid glands of animals or human subjects. Drs. Wood and Thomas introduced into the abdominal wall of one of our little patients, a portion of a gland removed

FIG. 79.—A WELL-MARKED CRETIN; TWO YEARS OLD—(*Samaritan Hospital*.)

FIG. 80.—THE SAME PATIENT AS FIG 79, ONE YEAR LATER. A week of thyroid administration reduced his "coagulation time" from 10 minutes to 2 minutes. In a year he has cut all of his teeth, is talking [illegible] with the aid of objects.—(*Dr. Illmann.*)

woman with exophthalmic goiter. The patient was temporarily
ed, but subsequently relapsed. (See Fig. 78.) We believe
e failure was due to the site selected for implantation. Had the
een placed in a more vascular situation (Schiff), it might have
nd functionated. In connection with thyroid administration,
ally employ iodin in some form or another—generally the syrup
iodid of iron and hydroiodic acid.
cial training is needed for most of these subjects. *A priori*, one
nticipate this. They are usually months or years behind normal
n of their age when the thyroid treatment begins to relieve them
veritable physical thraldom. What has been said of the training
ocephalic children applies here.

4. Mongolian Type

s is a form of mental deficiency in which the subjects exhibit a
physical resemblance to the so-called Mongolian races. The
are usually dwarfed, and present some degree of mental de-
. The term is not strictly a scientific one, but it is so graphic
is likely to be retained in our nomenclature. It was introduced
igdon Downe in his ethnologic classification. The type is a
mmon one, being said to be present in from 3 to 5 per cent. of the
y deficient. In English institutions, however, about 10 per cent.
patients are Mongols (Goddard), and our statistics at Had-
l show about the same proportion.
ology.—Many hereditary factors seem capable of so influencing
y as to produce the Mongolian type. Chief among these is
or immaturity of the parents. Carson of Syracuse has shown
y graphically in his tables. It is surprising how many Mongols
t-born or first-born children; particularly when we compare
ses to the cases resulting from intermediate births. One of our
arked cases was seen in the tenth child of an otherwise healthy
Clearly, immaturity and senility must weaken in some way the
ns of procreation, and our pathologic conceptions lend support to
w. If we accept this theory, we are not surprised that other
should prove of etiologic importance.
iori, we should look for such affections as syphilis (Sunderland),
losis, psychosis and neurosis to exert similar influences. They
ound in investigating the immediate forbears of Mongols. No
has had the remarkable experience of finding syphilis as fre-
s George Sunderland did (eleven cases out of twenty-five,
suspicion in two more). We could not be sure of it in one of

our twenty cases. The application of Wassermann's test should soo answer this point.

Pathology.—Shuttleworth has well described these patients a "unfinished children." The first autopsy, by Fraser, revealed a smal brain with marked simplicity of the gyri. The interesting studies o Wilmarth at Elwyn showed an undue smallness of the pons and bulb (about one-half the normal weight). Probably, in the non-develop- ment of these basal structures, with their important vital centers, we have the explanation of certain circulatory lesions. Congenital hear disease is exceedingly common, as John Thomson, Shuttleworth Sunderland (20 per cent.) and others have shown. Curiously enoug we have been clinically sure of heart disease in but one of our twen cases. This boy apparently has mitral regurgitation. Our expe ence would lead us to believe that hypothyroidea is present in ma Mongols. Whether as a result or a cause we do not know. As might expect, pulmonary tuberculosis often occurs in the subjects this affection.

Symptomatology and Clinical Course.—Probably this may 1 best described by comparing the symptoms and signs manifested I Mongolians to the symptoms and signs of cretinism, for which mong lianism is so often mistaken. This can be well done in a table, whi it is hoped that our photographs will further elucidate the difference

	Cretinism	Mongolian type
Height.....	Usually 3 feet or there about at maturity.	Usually 4 feet or more when adult li is reached.
Hair of the head.	Scanty, coarse, dry and brittle.....	Dark, straight and abundant, resembli the Mongolian's hair. It is sometin light in color.
Skull.....	Normal in size. Large. Asymmetric.	Small in size. The base is undevelop and the vertex is symmetric a rounded.
Eyes.....	Far separated. Lids exhibit myxedema, almost or totally closing the eyes.	The eyes are abnormally separat External canthii are usually higher th the internal (Mongolian slant). E canthal fold often prominent. Strat mus common.
Nose.....	Broad at the base and flattened. The nostrils are often large.	Very small. The nares are narrow a are often irritated. Crusts are oft present.
Mouth.....	Large, with thickened and fissured lips. The tongue is hypertrophied (macroglossia). Dentition delayed. Second dentition may never occur.	Very small. Lips often fissured. T gue large; but not to the extent s in cretinism. Transverse deep suration of the tongue is nearly alw present after the second year (Jo Thomson). Dentition delayed t second teeth appear in due seas The teeth are much crowded in the small maxillary and mandibular arch

	Cretinism	Mongolian type
Facial expression	Sad.—"The sad face of the Cretin suggests the cherishing of a secret sorrow" (Sutherland).	Happy.—"The smiling face of the Mongolian suggests the possession of some secret source of joy."
Ears	Nothing unusual. They may show the so-called stigmata of degeneration.	The concha is small and the lobule usually deficient and adherent. Lobulation is extremely simple. The canal is very small, making it difficult to see the drum. Middle-ear disease is common.
Nasopharynx	Enlarged tonsils and adenoids are common.	Probably adenoids and enlarged tonsils are always present.
Neck	The thyroid gland is absent or diseased. Pads of myxedema are seen above the collar bone.	The thyroid is present. No pads are seen.
Chest	Often flattened. A tendency to bronchial and pulmonary catarrhs. Heart disease is rare.	Often flattened. A tendency to bronchial and pulmonary catarrhs and tuberculosis. Congenital heart disease common. (20 per cent.—Sutherland.)
Abdomen	It presents the same characteristics in both—being prominent, and exhibiting diastasis and herniæ (umbilical, principally).	
Genitalia	Puberty does not take place. Hypoplasia.	Puberty not only takes place, but it may be precocious. There is a tendency to take on fat at this time of life.
Extremities	Short and stubby. Characteristic deformity of the leg.	Not so dwarfed. Usually slender and graceful. The fingers are of the long, artistic type (occassionally the fingers and toes are like those of Cretins). The little finger is incurved, unduly mobile, and possessed of a short second phalanx. (Finger of Telford Smith.)
Skin and subcutaneous tissue	Dry, coarse scanty hair, perspiration absent, "Putty color," eczema. Myxedema.	The skin is often dark, and exhibits a tendency to eczema. Myxedema absent.
Mental state and speech	Usually stupid. Mentality at a low ebb. Good natured. Vocabulary limited. Voice guttrual. Helpless.	Backward, or deficient. Mischievous and active. Wonderful mimics. (Some Court Jesters were probably of this type.) Speech acquired late; but may become very good. Voice rarely guttural. Often good workers under surveilance.
Thyroid treatment	Theatric results.....	Improvement of the eczema and other bodily conditions. Growth may be stimulated. The intellect is usually improved; but there are no such startling results as observed in cretinism.
Expectation of life	Poor. Vitality at a low ebb. If untreated, they usually die young.	Poor.

Diagnosis.—This has been fully considered in the table.

Prognosis.—The outlook for life has also been given. The patients seldom live beyond the third or fourth decades of existence, and they tend to die of pulmonary disease. Fraser's autopsy, however, was performed on a woman who died at the age of forty years. Mentally, the patients are usually classed as middle- or low-grade imbeciles. While we recognize that different cases vary greatly, we believe that such general statements do most of them injustice. Some of them, under treatment, become simply backward children.

and enlarged tonsils should be removed in all Mongols. Ever such operations the nasopharynx and the anterior nares are so that it may be still difficult to secure normal nasal breathing.

Groups 5 and 6

With the results of inflammatory conditions of the brain and membranes, and with blood-vascular causes of mental deficien shall have nothing further to say. The subjects are treated unc

Fig. 84.—The Mongolian Type. Incurved little fingers are well shown.—(*H Training School.*)

headings: Epidemic meningitis, cerebral hemiplegia and ce diplegia. In these two groups we can probably place the largest ber of cases of mental deficiency. We are becoming more and impressed with the importance of the disease encephalitis, or encephalitis (Strumpell), in its causative relation to mental deficie

7. Traumatic Type

Injuries are far less frequently responsible for mental disorders than is commonly believed; particularly if we exclude injuries sustained at birth, in instrumental or other difficult labors. Even in prolonged and difficult labors, we are convinced that asphyxia neonatorum plays a more frequent and important rôle in the production of damage to the

Fig. 85.—The Mongolian Type.

brain than external violence. Again, throughout infancy, the brain is saved from many of the ill effects of traumatism because of two facts: 1. Babies are not often permitted to fall from any great height. 2. The skull of the baby lacks rigidity, and consequently withstands external violence much better than the skull of the older child. With Dr.

Edward Martin, one of us studied a one year old baby who had tumbled forward from his high-chair. He had become momentarily unconscious, and had promptly developed a right hemiplegia, which had lasted for three days. A pulsating hematoma appeared over the left parietal bone. This disappeared in a fortnight, without operation. The parents refused to have the child X-rayed. Dr. Martin thought that there had been an intracranial hemorrhage, and that the blood had found egress through a fracture in the parietal bone. The fracture probably proved fortuitous. Spiller has laid stress upon the saving importance of fracture under just such conditions.

There still remains a certain number of cases, in which traumatism is undoubtedly the cause of mental sub-normality. One little patient under our care, was tossed in the air by his father; his head struck a chandelier and ever afterward his mental faculties were below normal. Injury wreaks damage upon the brain by producing epidural or subdural hemorrhage by inducing a serous meningitis; by producing a depressed or comminuted fracture of the skull, or a subsequent exostosis at the seat of fracture, or by actual laceration of brain tissue. We have seen all of these results with the exception of exostosis.

The **symptomatology** is varied, and we shall not go into it here, except to say that focal symptoms, whether they be paralytic or irritative (convulsions, etc.) should receive the closest study.

Treatment.—If the symptoms induced are those of meningitis, lumbar puncture should be performed for both diagnostic and therapeutic reasons. In our study of serous meningitis, we have cited a recovery after lumbar puncture. When symptoms of concussion have subsided, and brain symptoms recur, hemorrhage should always be suspected, and a surgeon should immediately be associated in the case. If motor paralysis exists on the same side as the injury to the skull, contre coup should be suspected, and operation delayed if possible (Spiller). Cases with mental deficiency and focal epilepsy should be studied by a competent Roentgenologist. If a definite focal lesion can be determined, the patient should be operated upon before the convulsive habit becomes thoroughly established. If mental deficiency remains in any of these cases, the child should receive special training as in the case of deficiency of other origin.

8. Syphilis

The Wasserman reaction has proved most useful in determining the relation of syphilis to disease of the nervous system. We earnestly advocate the pursuance of this study in all doubtful cases. Zappert's

chapter on "Hereditary Syphilis of the Nervous System" (Pfaundler and Schlossmann) is so complete, that we shall give here a brief résumé of it, even though certain findings bear no direct relationship to mental deficiency.

The nervous system may be attacked in the fetus, in early life, in late childhood or in adolescence. Such involvement from inherited lues is very rare in the first half of the first year of infancy. It is relatively rare until late childhood (tenth to the fourteenth years). When we think how long after the initial lesion, nervous syphilis appears in the adult (fifteen to twenty years), we are not surprised that such lesions should be so delayed in inherited syphilis. Heubner gives nervous involvement the seventh place in the order of organic disease resulting from hereditary lues. Rumpf finds nervous lesions in 13 per cent. of children affected by syphilis.

Pathology.—The following are some of the morbid lesions that may result: 1. Syphilitic endarteritis in the brain and cord; 2. syphilitic meningitis; 3. encephalomalacia and encephalitis; 4. isolated gummata in the brain or cord; 5. circumscribed or diffused sclerotic processes; 6. apoplectic cerebral hemorrhage (rare); 7. involvement of the cranial nerves (gummatous infiltration, degeneration and atrophy); 8. widespread degenerations, without characteristic luetic findings (parasyphilitic affections).

Symptoms and Physical Signs.—1. Convulsions, epilepsy. In a study of 400 epileptics in an institution Bratz found that 5 per cent. showed evidence of syphilis. 2. Headache, specific cephalgia. In our experience, this is prone to be exaggerated in the early morning hours. 3. Mental deficiency, often associated with pupillary rigidity, convulsions and palsies. "Acquired progressive dementia should always arouse the suspicion of syphilis." 4. Barring brain tumor and total blindness, pupillary rigidity should always suggest syphilis. 5. Ocular palsies, including those of the extrinsic musculature, optic atrophy and chorioretinitis, are all suggestive. 6. Palsies of other cranial nerves. 7. Speech disturbances—dysarthria, bradylallia and aphasia, accompanied by mental deficiency. 8. Palsies (monoplegia, hemiplegia, diplegia). Monoplegia, particularly involving the arm, is very suggestive. Athetosis, tremor and ataxia. There is often mental deficiency. 9. Sensory disturbances are rare, and the sphincters usually escape. Blindness has been mentioned, and deafness may result from labyrinthine disease. Pains also occur in the rare juvenile locomotor ataxia. 10. The deep reflexes are usually increased, except in juvenile tabes.

The above symptoms tend to become grouped to furnish some of the following more or less defined clinical entities: A. Acute or chronic meningitis. B. Hydrocephalus. C. Cerebral infantile palsy. D. Brain tumor (rare in the first decade). E. Multiple sclerosis (rare). F. Tabes dorsalis and progressive paralysis. The last two conditions named we shall treat under their respective headings.

Diagnosis.—The above-mentioned symptoms and symptom groups furnish us with important diagnostic sign boards. Ocular palsies, Argyll-Robertson pupils, chorioretinitis, monoplegia and Jacksonian epilepsy deserve most serious consideration. The search for somatic evidences of syphilis should be carefully pursued, even though parental histories prove negative. The Wassermann reaction furnishes important evidence; though if the patient has been treated a negative reaction may possess small value.

Prognosis.—Juvenile tabes or juvenile progressive dementia do not respond to specific treatment. Again in other luetic conditions irreparable damage may have been done ere treatment is initiated. Despite these adverse facts, however, nervous disease with syphilis as a cause offers a better outlook than organic nervous disease of other origin.

Treatment.—Mercury is the drug upon which most reliance should be placed. By inunction or injection it should be pushed to the point of tolerance, then temporarily suspended (say for a week), then given again as before. Hot baths or packs, or cabinet baths should be daily given during the period of its administration. Mercury is a true specific, having a destructive influence upon the treponema pallidum. In spite of Ehrlich's original contraindication—advanced cardiovascular and nervous disease—some interesting results would lead us to employ salvarsan in nervous syphilis that did not respond to mercury. After such treatment, we should again employ mercury. The iodids should be employed in as large dosage as the patient's tolerance will permit. They are to be viewed not as specifics, but as absorbents of organized pathologic tissues. (Gummata, meningeal exudates, etc.) Good hygiene, ample rest and tonics, are to be always thought of and employed in the treatment of these patients. In the anemic, their employment becomes imperative.

9. Epilepsy

The tendency of many epileptics toward mental deterioration is well known. The subject will be dealt with in the chapter upon epilepsy.

10. Innutrition

Weissmann in the discussion of "germ plasm" and its practicable immutability, admits that even it may be influenced by good or bad nutrition. Many nutritive factors may influence the rapidly growing sensitive nervous system in infancy and early childhood. Atrophy, rickets, starvation, etc., are all capable of interfering with nervous development and producing mental deficiency.

Nevertheless, the number of cases clearly due to these causes is astonishingly small. Rickets is probably the most important condition in this category. Already we have called attention to infantile eclampsia (spasmophilia), tetany, laryngospasm, head nodding and head rotation, delay in motorial and sensorial development and late acquisition of speech in this disease. We have seen several cases of mental deficiency in which practically every other cause could be excluded.

11. Primarily Neurotic

These children, if misunderstood and mishandled, may readily deteriorate mentally. There seem to be important turning points in their lives when they may either degenerate or develop into good, possibly supernormal individuals. The relationship of mentally deficient children to genius, like that of insanity to genius, is at times a close one. Parents, educators and physicians, should all strive to see that nervous children are directed along proper pathways.

12. Mental Deficiency Through Deprivation

The loss of sight or hearing at an early age may readily result in mental subnormality. But compensation for loss of function in a child's nervous system is a truly wonderful phenomenon, and children so bereft may become, under special instructions, not only normal but brilliant adults. In substantiation of this statement, it seems almost superrogatory to quote the cases of Laura Bridgman, Miss Helen Keller, or "Laddie." (Report before the National Education Association, 1906, by Miss Rheinhardt.) From the earliest period of life the slogan for such children is special education by a specially trained teacher. We cannot do justice here to the importance of the lip method, etc., in the teaching of the deaf, nor to the various methods of instructing the blind.

13. Family or Familial Types

In certain families there is observed a marked tendency toward limitation in the lives of nerve cells. Children born into such families develop normally until certain periods of life are attained, when development ceases and degeneration begins to take place. The length of life of the nerve cell seems literally predestined. Gowers has applied the term "abiotrophy" to this tendency. Some diseases in which this is manifest are amaurotic family idiocy (Sachs), Friedreich's ataxia, family spastic paraplegia, Huntingdon's chorea, etc. Some of these diseases appear in later life, Huntingdon's chorea as late as the fourth decade, and others will be dealt with under their respective titles; but occurring as it does in infancy, and presenting as it does characteristic pathologic and clinical pictures, the first mentioned affection deserves more than a passing notice.

Amaurotic family idiocy is a disease of infancy characterized by widespread nerve cell degeneration, and giving rise to a symptom-complex in which motor weakness, spasticity, progressive mental failure, blindness, and characteristic eye-ground changes are the prominent features. The patients seldom live much beyond the second year of life.

History: The first good description of the eye-ground was furnished by Tay (1881), and by some the disease has been called Tay's disease. It was Sachs, however, who gave the first complete clinical description of the affection, and who made the first important collection of cases. Kingdon and Russell, Hirsch, and Spiller have made important pathologic studies, and though the interpretations of their findings have differed somewhat, the findings themselves have served to place our knowledge of morbid anatomy upon a firm foundation. The largest collection of cases has been made by Falkenheim (64 cases), and he feels with Sachs, that it is no longer necessary to make such collections. One of us (McKee) had an opportunity to study such a case clinically, while Mary Buchanan had many opportunities to study his eye-grounds. She made some beautiful water-color plates of them. Immediately after his death the vitreous humor was withdrawn from both his eyes, and a 10 per cent. formalin solution was injected into the posterior chambers of both eyeballs. The eyeballs were thus hardened *in situ*, and Shumway was given the opportunity to study them before postmortem changes could take place. Spiller received the brain, cord and a section of a peripheral nerve. The studies of the last three authorities may be regarded as classic contributions to this subject.

Etiology.—The disease is clearly a family one. Of Falkenheims' sixty-four cases thirty-seven occurred in the members of thirteen families. In England, Kingdon had the interesting experience of studying five cases, three pathologically, developing in a family of seven children. Carter called attention to the remarkable fact that nearly all of the patients were Jews. In Falkenheim's collection, only four cases were noted as having occurred in the children of other races. Most of the families have come from Russia or Poland, though curiously enough, few cases have been reported from the countries whence they have emigrated. Whether or not a toxin is conveyed through the mother's milk as Kingdon and Russell suggest, remains to be proved. The disease has certainly occurred in hand-fed infants. Of necessity, the affection is one of infancy. Syphilis and other constitutional diseases have been ruled out as causative factors, though in Claireborne's case there was associated tuberculosis.

Pathology.—Whether or not there is simply an arrest of nerve-cell development, or whether there is an initial degeneration of nerve cells, is a mooted question. Sachs maintains that if development ceases the nerve cell will of necessity degenerate. Widespread ganglion cell degeneration is what the microscope reveals. This affects the ganglion cells of the brain, the spinal cord and the retina. The optic nerve fibers are degenerated, as are also the axons of other cells. There is no increase in the neurogliar elements, nor are there changes in the blood-vessels. Edema of the retina has been observed.

Symptomatology and Clinical Course.—At three or four months of age the baby usually begins to exhibit weakness of the neck muscles, so that the head is not properly supported. Weakness with flaccidity of the limbs usually follows very soon. If the child has reached a stage of development where notice is taken of parents, colors, toys, and other things, such interest is very soon lost, and increasing apathy is observed to accompany the progressive loss of mucular power. Usually. the parents become fully alive to the fact that something is markedly wrong when the child exhibits progressive failure of vision. The picture revealed by the ophthalmoscope is absolutely characteristic, and without it the diagnosis cannot be made positively. "The macula itself is represented by a dark cherry-red point, which is surrounded on all sides by a large area, about twice the size of the disc or even more, very pale, with woolly-looking edges, its longest diameter being horizontal" (Taylor). Squint may be present, though the ocular muscles are not always affected. Nystagmoid or slow rolling movements of the eyes are common.

The flaccid state of the limbs is usually followed by a spastic one, with increased deep reflexes. Muscular twitchings and spasms are common though true convulsions do not occur or only mark the close of the disease. There is usually hyperacusis, and muscular spasm frequently results from the production of loud sounds around the patient.

Bronchitis and bronchopneumonia are of common occurrence, particularly the former. One or the other may close the scene. The affected subjects rarely live much beyond two years of age.

Diagnosis.—This can usually be suspected from the progressive failure of muscular power, mental acuity and vision. The study of the ophthalmologist confirms the suspicion. The disease represents a distinct nosologic entity, and with care cannot be mistaken for any other disease. On several occasions we have sent these children to the ophthalmologist, with the full conviction that his finds would confirm our suspicions.

Prognosis.—This is absolutely bad and with considerable assurance we may predict that the afflicted child will not live much beyond two years.

Treatment.—Prophylaxis, diet, drug and glandular treatments (thyroid, pituitary extract and suprarenalin) have all proved powerless to arrest or modify the progress of this disease. The most that we can hope to do is to guard the child from infections of the air passages, and to treat such infections when they have taken place.

14. Moral Deficiency

Children are dubbed morally deficient when they seem to be unable to distinguish between right and wrong. They appear to lack the moral sense just as some children lack color sense or the ability to distinguish musical tones. They are the incorrigible liars and thieves and truants of childhood; the cruel perpetrators of crimes against the person of adolescence or later life. History abounds in such cases, an extreme example being furnished by the one who "fiddled while Rome burned." Atrocious crimes of Jesse Pomeroy and the Henderson boy are still fresh in the public mind. Whether or not moral deficiency exists without mental deficiency, exhibited in other ways, is a mooted question. Fernald, in a masterful study of twenty-four cases (twelve boys and twelve girls) found that not one of the patients had advanced in mathematics beyond long division. Goddard, in a discussion of this paper, remarked that it was psychologically impossible

to conceive of moral deficiency as a separate entity. The moral imbecile was really an imbecile. Barr and others, on the other hand, recognize high-grade moral imbeciles, who are capable of education to a high degree. Our own experience would lead us to espouse the former view.

Etiology.—Heredity is important in many cases, the child springing from neurotic stock or worse. Such heredity usually means that the child is subsequently exposed to a vicious environment, and receives inefficient, unwise or actually vicious management. In other instances, symptoms are first noticeable after recovery from some fever (scarlet fever in one of our cases). In still other cases an injury to the head seems of etiologic importance. Moral deficiency may also be exhibited in the subjects of epilepsy; or in children exhibiting birth or antenatal palsies accompanied by mental deficiency.

Pathology.—We have practically no knowledge here, unless it be in the cases of paralytic patients and those who have sustained cranial injuries.

Symptomatology.—In many cases, as in that of Willie Henderson, the so-called stigmata of degeneration are apparent. These may be physical (high palate, asymmetric or peculiar ears, etc.), functional or psychic. Usually the last are exhibited in some other form than purely moral. We have mentioned Fernald's observation concerning inefficiency in arithmetic. Another common symptom is the relative insensibility to pain, particularly that inflicted in corporal punishment.

Frequently these patients, for we prefer to designate them as such, are winning in their manners and possessed of good address; but they are intensely egotistic and yearn for adulation. They are prone to be lazy and deceitful. They are often adept liars and thieves, and are frequently cruel to animals and to younger children. Usually they seem peculiar children from the very first—exhibiting idiosyncrasies that are more readily appreciated than defined. This is only an imperfect and incomplete portrayal of a type. On the other hand, the lower grade of morally deficient child, the epileptic or the paralytic, may be morose and openly brutal and bestial. In either case, with the occurrence of puberty or even before, sexual vices and perversions are likely to crop out.

The condition is a difficult one to diagnosticate, and opinions should never be formed too rapidly. This is particularly true of children exhibiting the higher grades of mentality. To say that the dividing line between the normal and the pathologic is ofttimes hard to discern, is but to voice a truism. Children rehearse more or less perfectly and

FIG. 86.—A THIRTEEN-YEAR-OLD BOY—AN INCORRIGIBLE AT SCHOOL. There is epsy in the mother's family; but the boy has had no convulsions. He is undersized; exophthalmos, an internal squint, crowding of the teeth and asymmetric ears. He somewhat improved by an adenectomy and complete tonsillotomy. In school he was less and mischievous: constantly disturbing discipline by raising and lowering windows

completely the history of the human race. Boys in particular tend to exhibit the traits of primitive man. The Wanderlust (as exhibited in truancy), petty thievery and lying are examples of such traits. Sexual vice, again, may be but the exhibition of a strong natural tendency in an immature subject, possessed of too little understanding and judgment to interpret and control it. Certainly civilized man, supposedly normal, fails in this last respect more often than in any other. Again, one cannot emphasize too much the importance of habit, good or bad, that is once firmly engrafted upon a nervous system. It is voicing another truism, to say that nerve impulses tend to follow the beaten tracks.

Diagnosis.—As we have said, this may be most difficult. Any one of us can recognize the juvenile offender who is markedly deficient; but nowhere do we find borderland cases more difficult to recognize than when we come to distinguish the morally deficient child whose intellect approaches the normal, from the normal child whose morals approach the pathologic. Time is always necessary in order that a correct judgment may be formed.

Prognosis.—By most authorities this is always viewed as bad—by some it is regarded as hopeless. What has been said of habit probably furnishes us with the true explanation of these views. If the child is palpably deficient mentally, he will probably always need custodial care. If, however, his intellect is normal in other respects, we do not view him as morally deficient, and we do expect much from properly directed education. The earlier he is taken in hand, the more chance is there for ultimate success.

Treatment.—This should comprise: 1. Physical care and training. 2. Education of the mind, usefulness in life being the principal goal. 3. Moral education. Physical treatment: Like other mentally deficient children, the morally deficient may be possessed of ill-nourished bodies or may present actual pathologic lesions that handicap them decidedly in their chances for betterment. If they emanate from the lower walks of life, good food, good hygiene and tonic medication may represent their principal needs. If eyesight be defective, proper refraction may be of inestimable service. If adenoids prevent them from breathing properly, expose them to frequent colds or other infections, or block their Eustachian tubes, these structures should be thoroughly removed. If adhesions of the clitoris or prepuce are seeming causes of genital irrita-

and window-shades. He also showed an inability to concentrate. He is anxious to work, but left to his own initiative he flies from one thing to another. He is affectionate and likes to please; but if goaded by discipline or injustice, he evidences fits of ungovernable rage. The boy was dismissed from school by a "Supervising Principal," only to be ordered back by a "Truant Officer." His need is for special education.—(*Courtesy of Dr. H. K. Carey.*)

tion, proper surgical intervention should be invoked. These l measures often fail to influence, however, the too deeply ingrafted sex habits. Cleanliness of body should be insisted upon and the ch tactfully taught to take pride in being clean. Exercise, in the form plays suited to his age, and in special exercises suited to his particu needs, furnishes us with valuable levers for his physical uplifti Much energy that might be viciously expended may thus be direc along normal channels.

It is well for him to become thoroughly acquainted with the heal physical fatigue that follows the day's work. If possible, he shoulc taught, as normal athletes are taught, that it is much better to something for the good of his team than it is to shine as an indivic star. If possible, also, he should be instigated to use his boas strength in the protection of the weak and helpless. Bullying, often a normal trait, should bring him into disrepute with his teacl and fellows, as it inevitably does the normal child or man.

Mental Training.—It is often said that to educate the mor deficient individual to a high degree, is but to place dangerous t in dangerous hands. In other words, that we enhance the crimir power to commit crime. Such a statement is diametrically oppc to the teachings of modern criminology. On the other hand, we n regard the principal already enunciated, the right of every child tc education, as an unassailable principal. Our efforts here must ind be directed by common sense, and our expectations must not be Utopian. In trite language, we should not expect to fit a round into a square hole, nor to make a silken purse out of a sow's ear. one knows, however, how much can be achieved until we consc tiously and intelligently try. After a sufficient trial, the skilled pe gogue should be able to estimate the abnormal child's mental capa and worth just as he estimates these qualities in normal pupils. Edu tion may then be directed along proper lines. Such lines may chiefly industrial, or they may aim to fit the subject for spheres intellectual activity. Much depends upon the teacher: He or should be an enthusiast; should possess a patience like unto that of J should be firm, concealing the mailed fist beneath the glove; sho thoroughly understand the psychology of childish attention. attention of the pupil must at first be passively engaged, by things t interest him. Later, he should be inspired to manifest earnest, ac attention in his tasks. Happily, though rarely, he may eventu attain a point where all else is forgotten in the love of the task. S a teacher is manifestly hard to find, and yet every requirement m

tioned is an obviously necessary attribute of the successful teacher of the young.

Moral Training.—The most potent factor in the education of the normal child is, we believe, imitation. The teacher or parent must be, or at least must seem to be what he would have his scholars or children be. Herbert Spencer says of parents "they are not good enough." We cannot lie or be otherwise deceitful, and expect our youthful charges to be truthful and straightforward in their dealings with us or with their fellows. Probably the next most important principal in education is the one so forcibly expounded by Herbert Spencer: the realization that every act brings its own natural punishment or reward. The brave act merits praise. The honest one confidence. The thief should be made to repay the one he has injured by the labor of his own hands. The destructive child must likewise be made to restore the injured property of others; or if he has destroyed his own property, he should suffer the loss. The child who inflicts needless pain on others should be made to feel pain himself. This introduces again the mooted question of corporal punishment. Whipping, as we have intimated, often fails of its purpose in these children. If it fails, as a corrective measure, it is worse than useless. Following a suggestion of Dr. Weir Mitchell's, we have found the faradic current of much service to these children. We regard the offending child as sick, and so tell him. He is mentally or morally ill. We apply the battery as a corrective medicine, and so inform him. At times we further enforce the lesson by applying the remedy to erring parts of the body—like the hands, the feet, or even the genital region. We heartily endorse this method because it often works; and no such measure should be regarded as solely punitive, but rather as chiefly corrective. Work, as we have already intimated, is a cure for many ills, and these children may need more than the usual measure. Surveillance of some sort, institutional or by a skilled tutor, should be exercised long after the child is regarded as cured. Companions must be carefully chosen, and the results of such associations carefully watched.

The teacher or caretaker should endeavor to mitigate all his judgments by not expecting too much of children. He or she should not let the child suspect this fact; but memory should be sedulously searched to determine what he or she might have done, or did do, at the particular child's age; and judgments should be formed accordingly.

15. Backward Children

In his educational classification of mental defectives, Barr defines the backward or mentally feeble child as follows: "The mental processes (are) normal; but slow, requiring special training and environment to prevent deterioration defect (is) imminent under (the) slightest provocation, such as excitement, overstimulation or illness."

Etiology.—The same authority states that the same causes, congenital or accidental, that cause true mental deficiency, may be provocative of backwardness.

Symptomatology and Clinical Course.—"The backward or feebly gifted child who can never keep up with his fellows, who is dreamy, unsocial, stolid often to stupidity; or who, nervous and excitable, wanders from one thing to another until some congenial occupation attracts and chains attention, appears more abnormal than do many imbeciles of high degree. So close are the lines in fact that a diagnosis is often extremely difficult and even the alienist must allow time and treatment to work out for him the problem." . . . . . "He is not a mental defective but a mental invalid, so to speak; possessed of all his powers, and has the same chance of attaining mental vigor that any sickly child has of being brought to normal health through proper treatment" (Barr). Indeed, in addition to the mental feebleness, there is often weakness, the weakness of a body improperly fed or of one shut off from its birthrights of cleanliness and fresh air. As in the case of mental deficiency through deprivation, adenoids, defective eyesight or deficient hearing, may one or all furnish retarding influences upon physical, nervous and mental development. Carious teeth may serve to provoke nervous excitement, and may also be responsible for disturbing and depressing toxemias. Impacted teeth, as Upson has so well demonstrated, may also be of importance here, as they may be in other types of mental deficiency and certain forms of insanity.

Diagnosis.—This as the authority quoted has stated, may be most difficult even to the expert. Probably nowhere is one confronted by more border-line cases, cases on the border-line of the normal and of certain types of mental deficiency. Response to proper special education, to well directed efforts at physical betterment, and time will finally determine the question.

Prognosis.—"The feebly gifted or backward child has not crossed the border-line, and by simply making haste slowly and avoiding risk of overstimulation may finally reach the goal of all normal minds, though by a more circuitous route" (Barr). We could cite instances

of truly great men, whose mental processes in youth had been regarded as slow or subnormal: Every experienced pedagogue knows of such cases; and biographic literature teems with them.

Treatment.—Special schools, such as have been formed in England, and in this country and elsewhere, should assume the education of these cases. The institution, the custodial colony or the custodian-tutor, should care for the backward child. We must emphasize once more the right of the child to be educated, and these feeble minded children have as much right to special education as physically weak children (to use Barr's figure) have to special nutriment, to special hygiene and to special medication. Medicine, in its broadest sense including prophylaxis and natural therapeutics may do much for backward children. As we have indicated, there may be, too, important work for the ophthalmologist, the rhinologist, the otologist, the dental surgeon, and the pediatrician, as well as for the pedagogue and the child-psychologist.

INSANITY AND DISTURBANCES OF THE MIND IN CHILDREN

The subject of mental disorders occurring in children can only be treated, in a book of this size, in a general and comprehensive way.

Insanity is uncommon in infancy and childhood, but as Spitzka remarks, "the seeds of it are often sown then." The careful elicitation of the histories of insane adults revealed that over 4 per cent. of them committed insane acts in childhood. It should be stated that the very natures of immature brains and minds preclude the latter from portraying insanity as it is evidenced in adult aberrations of mind. The same incompleteness of development makes the diagnosis of insanity in childhood more difficult.

It is stated upon good authority that from 10 per cent. to 30 per cent. of infantile insanities are due to the infectious diseases; but Spitzka found that only 7 per cent. of his cases arose from this source. From a great number of authorities, the following causes of insanity in early life have been gleaned:

How many of these causes are preventable! Only the influences of heredity are not so; and even these may be modified or totally overcome by good hygiene and wise education.

We will give a brief review of the different forms of insanity occurring in children, modified after Mills:

agitated, and the hypochondriacal. Depressing surroundings and deprivations sometimes drive children to suicide.

Circular or alternating insanity is a form in which there is first, exaltation or mania, followed by mental depression and then a lucid period, and later exaltation, again to be followed by brief melancholy, the cycle coming and going with variations.

Choreic insanity is a form of mental disturbance occurring in chorea, which is a variety so severe as to exhaust the patient, interfering with sleep and health. It is sometimes of a very violent character, with great emotional exaltation. This will be mentioned as chorea insaniens, in the chapter dealing with Sydenham's chorea.

Hysteric Insanity.—In childhood acute mania and hysteric mania run together into a picture most difficult to differentiate. If the characteristic symptoms of hysteria are present—ecstasy, catalepsy, trance, aphonia, and fantastic emotions or false palsies—there will be little difficulty in distinguishing between hysteric conditions and insanity. Extraordinary occurrences which have given rise to the suspicion of visitation by spirits, by rappings, cat-calls, rooms being set on fire, and such like things are very likely to be the result of this form of disorder among children, especially girls. Frequently there arise in institutions and schools imitative psychoses, occurring in epidemics; there are then ordinarily found among the symptoms disturbances of speech, hallucinations of sight and sound, and false palsies.

Cataleptic insanity, or catatonia, is very rare among children. It may be seen at puberty or beyond as a form of dementia precox. This form begins usually as a mania, followed by melancholy, with stupor, and instances of dramatic exhibitions following.

Epileptic insanity is not rare in children of well-marked imbecile or idiotic characteristics, and who are the victims of epilepsy. Sometimes attacks of insanity or mania occur among children who suffer from epilepsy, and who in the interval between the attacks are apparently sound in mind. The mania may occur just before or after the epileptic paroxysm, or replace it ("Epileptic equivalent"). It should not be a source of surprise if epileptic children occasionally show marked perversion of character and manner.

Paranoia, or primary delusional insanity, is a chronic form of mental disease or, in certain instances, mere mental instability accompanied by insistent ideas, exaggerated self-consciousness and perversity of character, and morbid impulse. Paranoia is rare under the age of puberty, but to the trained observer certain marked peculiarities and eccentricities will lead him to predict the development later, in such de-

fectives, of delusional insanity. By many authorities such cases are classed under dementia precox. The symptoms are gross peculiarities in dress and conversation, obtrusive ideas and egoisms, tendencies to dreamy states, and a bustling attempt at remarkable plans leading to nothing, unduly emphasized concepts or misconcepts, with alternate periods of depression and emotional excitement.

Moral insanity and moral imbecility are terms which are needed to describe those vicious habits and tendencies constantly showing themselves in certain children who are otherwise apparently wholesome minded. Instinctive perversions and morbid impulses flow out of some inherited constitutional conditions which are at the root of monomania and paranoia. To estimate rightly such states as these it is necessary to understand fully such words as "concepts," which may be morbid or imperative; also "imperative movements," "insistent ideas," or unhealthy propensities. The concept is a definite or isolated thought, which may become an obsession and tyrannize the mind. Imperative movement or action is an unhealthy impulse, the result of an imperative conception. The term "insistent idea" is used to describe a habit of thought resulting from the repetition and multiplication of morbid conceptions, which may, after a time, interfere with and dominate the acts of volition and intellect.

Dementia Precox

There are some authorities among psychiatrists who do not recognize dementia precox as an entity, but who believe that several psychoses are simply colored by the mental peculiarities of puberty. An interesting discussion of this subject, pro and con, will be found in Stanley Hall's "Adolescence." Most psychiatrists admit, however, that the work of Kraepelin and others has placed dementia precox on a firm nosologic basis.

Definition.—According to White, "dementia precox is a psychosis essentially of the period of puberty and adolescence, characterized by a dementia tending to progress, though frequently interrupted by remissions." Upon the foundation of dementia are erected various psychotic symptoms, many of which show a marked tendency to episodic manifestations.

Etiology.—Age is of considerable importance, as the definition just given has indicated. The subjects may have shown idiosyncrasies in earlier life, however. The two sexes are about equally affected. Heredity is of vast importance, and in some family trees we find other

instances of dementia precox. The inheritance need not be an insane inheritance, however; but we may find neuroses, syphilis, etc. The patient may have been a dullard in his early childhood; but not infrequently he has been considered precocious. The principal fault, in all probability, lies in the patient's potentiality for development. As the French say, the weakling "becomes stranded on the rock of puberty." Numberless exciting causes, mentioned in our table, may appear to furnish the strain that breaks. (Fright, overstudy, hemorrhage, masturbation, etc.)

Symptomatology.—Mental: Failure of voluntary attention and lack of interest are the first to appear, and the most conspicuous mental symptoms. Memory becomes defective, though much of this may be due to lack of attention. Emotional deterioration is also apparent, so that the patient remains untouched by the death of a near relative or the visit of a close friend. The content of thought is shallow and "dilapidation of thoughts" in evidence. Conversation becomes a "veritable word salad." With thought deprivation, the patient may think himself robbed of thought by his enemies. Mentally, the subjects of dementia precox are inaccessible.

Physical Phonomena.—Emaciation is often seen early. Anorexia and insomnia are common symptoms. Circulatory disturbances often appear in the form of rapid heart-action and cyanosis. Dermographia shows the instability of the vasomotor system. The pupils are widely dilated and the deep reflexes are usually plus. Epileptiform and hysteriform attacks are often seen. White recognizes five types of the disease: 1. Dementia simplex; 2. Hebephrenia; 3. Catatonia; 4. Paranoid forms; 5. Mixed forms. Kraepelin only recognizes three forms: 1. Hebephrenia; 2. Catatonia, and 3. Paranoia. For a discussion of these various forms, we must refer the reader to works upon psychiatry. The same must be said of differential diagnoses.

Prognosis.—Kraepelin states that 8 per cent. of hebephrenics and 13 per cent. of catatonics may make complete recoveries. Paranoid cases do not get well. Pickett said that only one-fourth of the hospital cases were cured.

Morbid fears, or phobias, are conditions occurring on the borderland between mental health and disease, which may be transient or more or less permanent, and generally have to do with hereditary impressions. These may occur in a mild form and persist throughout a moderately useful life. Mysophobia, or fear of contamination, we have seen several times.

Paretic dementia is essentially a disease of adult life, but in rare instances is seen in children.

Etiology.—Inherited syphilis, or rarely acquired lues (syphilis insontium) is probably always responsible for juvenile general paralysis. In twenty-two cases, Dr. Mott could not exclude syphilis in one. The usual age of onset is puberty, though like the juvenile form of tabes, the disease may appear at any age between eight and twenty-three years. Other causes may appear to play exciting rôles; but neuropathic and psycopathic heredity are not in evidence.

Pathology.—This is so similar to the changes found in adult cases that we shall dismiss it very briefly: Marked atrophy in the frontal and central convolutions, thickenings and adhesions of the pia arachnoid, dilatation of the ventricles and a granular condition of the ependyma are the macroscopic changes. The microscope reveals atrophy of tangential fibers; atrophy and disintegration of cortical neurons, marked overgrowth of glia cells and cellular proliferation around the vessels (Taylor).

Symptoms and Course.—As in dementia precox, the subject may have been a dullard or may have been thought precocious. The two sexes are equally affected. Advice is usually sought because of noted mental changes, bodily weakness or the occurrence of fits. Occasionally, there has been failing vision, as a result of optic atrophy. The patient presents marked bodily, nervous and mental phenomena.

Physical Changes.—The patients are usually much undersized and undernourished. The reproductive organs may be infantile. Weakness of the limbs is common. Many of the patients reveal indubitable evidence of hereditary syphilis. That the Wassermann reaction will soon prove of much use in the study of this disease may be safely predicted. In one of our cases, Dr. Robertson secured a positive luetin reaction, when the Wassermann had proved negative.

Nervous Phenomena.—Weakness and tremor are nearly always noticeable rather early. Finally the legs become paralyzed and contractured. The deep reflexes are usually increased. In four of his twenty-two cases, however, Dr. Mott found the knee-jerk absent. The Babinski reflex is often present, ankle clonus more rarely. Eye phenomena may be in evidence. Pupillary inequality and irregularity, sluggish or absent reaction of the pupil to light, optic atrophy and even complete blindness. Epileptiform attacks usually appear late and may close the scene.

Mental Symptoms.—Delusions of persecution and grandeur are less liable to be in evidence than in the adult forms of paresis. "Dulness

apathy, loss of memory, are the marked mental symptoms, though these may occasionally be varied by an outburst of excitement or even passion." (Taylor.)

Diagnosis.—This must be made from dementia precox and from brain tumor. There will be few mistakes if the possiblity of occurrence of the different affections is kept in mind.

Prognosis.—The course of the disease is slower than in adults; but it usually kills in three or four years.

Treatment of Insanity in Childhood.—To deal with this subject adequately, many chapters might well be written. Our first duty leads us to scan the field of prophylaxis. Much may be done to avoid psychopathies by physical betterment and rigid education of the predisposed. (Neurotic, etc.) Drug therapy may also be of service in the tuberculous and the syphilitic. Once affected by mental disease, the most skilful nursing and medical care are necessary. Unless they can be secured at home, the patient should receive institutional care; though, if possible, he should be saved from the stigma of the asylum. One of us was much impressed by a remark made to him by Dr. Weir Mitchell, "If I had my life to live over again, I should devote it to the study of insanity. Insane people should not be associated with the insane; but with normal people." Such normal persons, however, must seem almost super-normal to successfully conduct the work of redemption. They must not be fearful of the maniac, depressed by the melancholiac or misled by the delusions of the paranoiac. They must be people who understand the insane, and who sympathize because they understand. They must also possess sufficient practical experience to apply their knowledge. Treatment, to be successful, must carefully draw from the following wells of resource: Hydrotherapy; rest on the one hand, and active exercise in the open air on the other; good food; good hygiene; occupation; wise medication (particularly for the bowels, for lues, or tonics for the undernourished). Psychoanalysis (Freud) and suggestive treatment, may play their parts in the scheme of special education necessary for the individual patient.

DISEASES OF THE SPINAL MEMBRANES AND OF THE SPINAL CORD

Spina Bifida

Spina bifida, often accompanied by hydrocephalus, is the principal congenital anomaly of the spinal cord. The patient shown in illustrations displayed both conditions. The condition is really a

surgical one, and for a description of it, the reader is referred to standard works upon surgery. The affection is mentioned here, simply because of one rare form which may deceive the uninformed, or the unwary: *Spina bifida occulta*, or occult spina bifida. In this form there is no protrusion of spinal membranes or cord; but the defect in vertebral arches may usually be detected. Over the defect there is often an excessive growth of hair, and there may be a dimple or depression just below the coccyx. Patients so afflicted may exhibit lack of sphincter control, anesthesia in the perineal region, and weakness in the lower extremities. Again we must refer the reader to standard surgical text-books or to Gower's classic work on nervous diseases.

FIG. 87.—SPINA BIFIDA AND SLIGHT HYDROCEPHALUS.—(*Samaritan Hospital.*)

COMPRESSION MYELITIS

Synonyms.—PRESSURE PARALYSIS OF THE SPINAL CORD; PARALYSIS FROM POTT'S DISEASE; POTT'S PARAPLEGIA

Etiology.—The causes of this important disease of childhood are the causes of Pott's disease, plus the pressure exerted by distorted vertebræ or by the thickened mass (a tumor according to Macewen) resulting from tuberculous pachymeningitis. As the term suggests, myelitis results.

Morbid Anatomy.—The portions of the cord most often affected are the cervical and dorsal regions. Gibney states that 50 per cent. of patients with Pott's disease affecting the upper portion of the spine, develop paraplegia. When the body of a vertebra or of several vertebræ have broken down from tuberculous disease, marked angulation of the spine results. Under such conditions pressure is likely to be exerted upon the cord. Occasionally, though much more rarely, similar conditions obtain in the lumbar regions. Pressure may be brought to bear suddenly by the slipping backward of a diseased vertebral body. In other instances, no angulation is observable; but as already mentioned, the thickened mass, resulting from tuberculous

disease of the dura, exerts pressure upon the cord. In either case the pressure is usually exerted anteriorly; but it may be effective all around the cord. The cord itself soon becomes the seat of inflammation. It is smaller at the side of the lesion, much smaller in chronic cases.

Microscopically, we note invasion by leukocytes, and sometimes degeneration of the various cord elements. Descending degeneration of the pyramidal tracts may be very marked below the sight of the lesion; but ascending degenerations of the afferent tracts also take place. Pressure may be made upon the spinal routes, and their fibers may also degenerate.

As in other cases of tuberculous disease, tuberculous foci are often found in other portions of the body, but it is remarkable how rarely the leptomeninges become involved in a generalized tuberculous process (tuberculous meningitis).

Symptomatology and Clinical Course.—The symptoms of this disease may appear at any period of the child-life, as they may in adult existence. Usually they are preceded by a period of failing health. The first symptom of onset usually noted is a tendency to tire easily, particularly in the legs, and a disinclination to use the extremities freely. If the lesion is in the cervical region, weakness of the arms may also be manifest. More rarely the muscles of the arm waste, because of pressure exerted upon the nerve routes supplying them. Sensory symptoms may not be present at this time, but there may be "starting pains" in the extremities at night, and soon the girdle sensation may appear.

Nocturnal enuresis, appearing in a child who has not previously exhibited it, is another significant symptom. Later, a loss of sphincter control, or at least diminution of control, may furnish an annoying symptom both day and night. Voluntary control of the sphincter ani may be pitiably insufficient, particularly when laxatives have been administered to the patient.

Examination of the child at this time may reveal a slight kyphosis; but in order that this be produced, it is necessary for the body of a vertebra to break down, and for two previously separated bodies to come together. So there may be no deformity, only the stiffness of the spine, the pain produced by coming down hard on the heels, the tenderness to percussion over the disease region and the possible sensitiveness to heat and cold locally applied, to guide us to a proper diagnosis. In doubtful cases, a good skiagram may prove most helpful. In the cervical region there is usually no deformity; but there is much thickening, giving a brawny feel to the surrounding tissues of the neck.

In the lumbar region too, absence of deformity is the rule. The

proper diagnosis may be revealed in some cases by the appearance of a lumbar or a psoas abscess.

The motor nervous phenomena are usually of the spastic type. The knee-jerks are exaggerated, and in cervical Pott's disease, the various arm reflexes are similarly increased. Ankle clonus is often present and the plantar reflex is of the extensor type. In advanced cases the gait may be spastic and the legs held together firmly in standing or walking. Sensory phenomena may still be confined to those mentioned; but on the other hand, various regions of anesthesia may be found, corresponding to the different sensory route of supplies. One of the various tuberculin reactions, preferably the Von Pirquet, may show the nature of the spinal disease.

Diagnosis.—Taylor says: "In no condition is the old dictum truer, that more things are missed by not looking than by not knowing, than in cases of spastic paralysis of obscure origin." In early cases, the diagnosis may be difficult to make; but it will be rendered less so if the medical attendant learns to suspect the spinal origin of every case of spastic paraplegia appearing in a previously healthy child. As already mentioned the tuberculin reactions and the X-ray may help us in obscure cases. The mental symptoms, and the convulsions, so common in spastic paraplegia of cerebral origin, are absent in this disease. Spastic paralysis of the family type is revealed in the family history and in late appearance of that disease (usually at puberty or beyond). Multiple sclerosis is so rare in childhood, that some notable authorities doubt its occurrence.

Prognosis.—This depends upon the previous strength of the patient, upon whether his lungs are demonstrably involved, or upon the existence or absence of widespread tuberculosis. It may also depend upon the environment of the patient, upon his mechanical and general treatment, and upon the length of time that his nervous symptoms have existed prior to the institution of treatment. Advanced pulmonary or general tuberculosis necessarily renders the outlook grave. Amyloid disease is also of serious prognostic import. In open-air sanatoria and indeed with good open-air treatment at home, with good feeding, and with properly enforced rest, these patients do surprisingly well. The most prompt results naturally follow in recent cases; but wonderful cures have been effected after months, and even years of helplessness. With Gibney's careful statistics as criteria, we may safely assert that more than half of the patients will completely recover from the paraplegia. With early recognition of the disease, with recent advances in treatment, we may safely look for much better results. That thirty-

one of Gibney's 133 patients died, shows us more eloquently than words how far advanced many of his cases were.

Treatment.—Rest is the first thing to be enforced—not only rest in bed, but also local rest produced by the fixation of the spine in a proper apparatus. Probably best of all is a skilfully applied plaster jacket. Counterextension is seldom needed. When the nervous symptoms have disappeared, and the absence of fever has indicated a subsidence of the tuberculous process, the little patient should be gotten out of bed; but some fixation apparatus must be worn for at least two years after the disappearance of symptoms.[1]

Open-air treatment is necessary—twenty-four hours out of the twenty-four. Probably, as has been demonstrated at "Sea-Breeze" and other sanatoria, sea air is best of all for these children. The patients should be well fed—somewhat overfed—and proteins and fats should be amply furnished in their diets.

Paralyzed parts should be carefully looked after to prevent the occurrence of trophic lesions.

Laminectomy has been exploited in recent years. It is probably not needed in most cases. In acute cases, particularly in those involving the upper cervical region, skilful laminectomy may save life.

ANTERIOR POLIOMYELITIS

Synonyms.—POLIOMYELITIS ANTERIOR ACUTA: INFANTILE SPINAL PARALYSIS; ATROPHIC SPINAL PARALYSIS; ESSENTIAL PARALYSIS OF CHILDHOOD

History.—The disease was first described by Underwood in 1774; but the first good description was given by Heine in 1840. Rilliet and Barthez described it in France under the name of "essential paralysis of childhood" (1851). Prevost (1865), followed by Lockhart Clark, found the anterior horns affected, and was responsible for the name now given the disease. Drummond (1885), gave the first description of findings in a recent case. Rossiter (1889), Rogers and Damaschino (1891), Pierre Marie (1892), and Goldscheider (1893), have added much to our pathologic knowledge. Many studies of epidemics have been made in this country, in Norway and Sweden, etc. To Flexner of the Rockefeller Institute, belongs the crowning triumph of making important additions to our etiologic knowledge. (As we are going to

[1] One or another of the modern operations that seeks to fix the diseased area with transplanted or implanted bone may prove ideal for these patients.

press we learn that he has discovered the specific micro-organism, the smallest known.)

Definition.—Acute anterior poliomyelitis is an infectious disease, usually affecting young children, appearing in epidemic or endemic form, giving rise to flaccid paralyses more or less widely distributed and more or less crippling in character.

Etiology.—The disease is almost certainly dependent upon invasion of the body by an ultramicroscopic organism; one that will pass through a Berkfeld filter (Flexner). Experiments of the same high authority make it probable that the organism invades the body through the nasopharynx, as in epidemic meningitis.

According to most students of this disease, it occurs more frequently in boys, though in Sinkler's statistics the sex difference was not marked. It is preeminently a disease of early life, and is more frequent in infancy than in childhood. James Taylor's figures, which may be considered typical, show that 105 of 113 cases occurred in the first decade of life. Of the 105, thirty-three were stricken during the first year (nine under six months, twenty-four in the second half of the first year); thirty-seven in the second year; fourteen in the third; eight in the fourth; six in the fifth; four in the sixth; two in the seventh, and one in the ninth year. One of our most crippling cases occurred in a splendidly developed little girl, nine years old.

As first pointed out by Sinkler, a seasonal relationship is most important. The disease is more frequent during the hot months of the year (July and August in England and in this country). In Australia, as we might anticipate, December, January, February, March and April are the months of greatest incidence.

The relationship of other infectious diseases to poliomyelitis is probably of importance. Two of our cases followed scarlet fever, and cases have been reported after measles and other infectious diseases of childhood. Diarrheas of the summer season also precede the onset of this disease in not a few instances. It is readily conceivable that such affections may lower the little patients' resistance to the materies morbi of this disease, or even that their catarrhal lesions may afford direct pathways for invasion. Poliomyelitis has also followed fatigue, as from a long walk. Again, it has occurred soon after injuries to the limbs and spine. Once more, it is conceivable that tissues of lowered resistance (as a result of fatigue or injury) may invite invasion of the disease under consideration.

Epidemicity has been noted by a number of authorities. The epidemic of Norway and Sweden (1905–1906) was followed by the

appearance of the disease in New York and Boston (1907) (ports to which many Swedes immigrate). The disease then appeared, in epidemic form, in Wisconsin, Iowa, etc. (states in which many of these immigrants settle). Very recently Rosenau has found that the stable-fly is a carrier of this disease. In certain small epidemics, it would appear possible that the disease had followed water-courses. Thus, cases have been successively observed at Bethlehem, Trenton, Torresdale, etc. Some of the boys affected in these towns were taken after swimming.

Pathology.—Charcot viewed the cord changes as those of a primary parenchymatous degeneration; and Rositer, from a study of recent cases, supported this view. Rogers and Damaschino, however, concluded that there was a primary interstitial myelitis. Pierre Marie (1892) called attention to the vascular origin of the process, and Goldscheider practically proved the correctness of this latter view.

To be understood, the morbid anatomy must be studied from two standpoints: 1. Changes that are noted early in the rapidly fatal cases. 2. Changes that are noted after the lapse of months or years. "It is known that the anterior horns are supplied by branches of the anterior spinal artery, and in cases which have ended fatally within the first few days, the regions of supply of those branches have been found necrosed and softened, the vessels blocked, much extravasation of leukocytes around them, and the nerve cells completely disorganized. Many degenerated fibers are also found" (Taylor). Round-celled infiltration is also present, and minute hemorrhages are also common. Such finds have not been observed only in the anterior roots; but also occur, though in less degree, in the posterior roots. Meningitis represents another find, and it may be primary. Polio- or meningoencephalitis has been observed in the subjects of poliomyelitis, and also in some subjects whose spinal cords have remained unaffected, but who had been stricken during epidemics of anterior poliomyelitis. In still other cases the basil ganglia and bulb are affected by similar processes.

2. Changes observed after the lapse of months of years: Even to the naked eye cross-sections of the spinal cord appear shrunken. The shrunken areas are most often unilateral, making the unaffected half of the cord appear much larger by contrast. The changes are sclerotic in nature. Ganglion cells of the anterior horns may not be discernible, or they may be fewer in number and scarcely recognizable. Degenerated white fibers are also found. Spider cells may be present. Larger vessels may traverse the affected areas, and their walls may be thickened. The anterior roots present many degenerated fibers, and these may

be traced to the affected muscles. The muscles themselves are markedly atrophied and may be very pale when compared to their unaffected antagonists. Partially paralyzed muscles present various shades of pink. In some cases there may be almost complete disappearance of muscle fibers, but usually some remain intact. Adipose may replace the normal muscle substance.

The bones are usually shortened and their shafts are thinner. On the other hand, one may rarely observe actual elongation of bone. The ligaments are often loose, and actual separation of joint surface may occur in the shoulder, hip and knee.

Symptomatology and Clinical Course.—As already mentioned, the onset of the disease may vary almost as much as its resulting paralyses. Certain of the cases appear to follow diarrheas of the summer season, some of the exanthemata, or injuries. The affection is usually ushered in by fever, malaise, pain in the back and extremities. In contrast to diarrhea, marked constipation may obtain. In other cases, convulsions accompany the initial symptoms and the consciousness may be markedly obtunded. Convulsions in some cases may be toxic, but more recent pathologic knowledge would incline us to view them as more frequently dependent upon meningitis or upon the existence of encephalitic processes. Sweating was often observed in the children affected in the New York epidemic—rendering the unwary too prone to diagnosticate the disease as rheumatism. In a certain, though smaller number of cases, the onset of paralysis is sudden, without marked constitutional symptoms. Thus a child goes to bed well, and awakens paralyzed, or he actually becomes paralyzed while actively engaged in ordinary childish activities.

In the presence of an epidemic, the physician should always be on guard when the symptoms first detailed appear in an infant or child.

The paralysis usually appears suddenly, even when the medical attendant is alert. Thus, in a personal experience a child became suddenly weak in her legs on the morning of the third day of the disease. By nighttime her legs were absolutely immobile. In this particular case, Dr. Elmer of Wayne had suspected the nature of the disease from the very first. When systematic examinations are not made, the medical attendant may be unaware of the paralysis until he attempts to get his little patient out of bed. The paralysis is flaccid from the first and its extent is nearly always greater when first noted than it will be after the lapse of time. Atrophy appears very early, and usually reaches its maximum degree in from ten days to two weeks. The deep reflexes are usually lost from the first. This is particularly true

of the knee-jerks. The plantar reflex may be absent even when the patient clearly shows that he feels the tickling sensation.

Electric response to faradism promptly disappears in the affected muscles. Muscles that respond to it will almost certainly functionate in some degree later on. In about ten days the galvanic reactions of degeneration appear, though it may require an expert to elicit them.

The anodal closing contraction becomes greater than the cathodal closing contraction.

The anodal opening contraction becomes less than the cathodal opening contraction.

We would impress upon the medical student and the general practitioner, the diagnostic and prognostic values of faradic response or failure of response.

The frequency of paralysis in various parts of the body: James Taylor quotes 115 cases of which he has accurate notes on this point: One leg affected in fifty-two cases, the left in thirty-four, the right in eighteen. Both legs affected in forty-three cases. (Of these one patient had the left arm and left thenar eminence affected; one the left arm; one both hands; three the right arm; one both hands, the right more than the left.

The arms only in eighteen cases (the left in eight; the right in seven; both arms in three).

One arm and one leg affected in two patients; one the right arm and left leg; one the left arm and left leg.

In addition to such cases—the well recognized types—every epidemic of size contributes its cases of polioencephalitis with resulting spastic hemiplegia, the superior and inferior types of Wernicke, facial paralysis, bulbar palsy, paralysis of the neck muscles, and paralysis of various muscles of the trunk. Again, though rarely, cases of the Landry ascending type of paralysis occur.

Epidemics of late years must oblige us to remould our views concerning this affection, and to regard it not as a disease of the spinal cord alone, but simply as one usually characterized by cord involvement.

The knee-jerk occasionally reappears in the paralyzed leg, and must not make us doubt the correctness of diagnosis. In the first case of this kind studied by one of us, Spiller found that the tibialis anticus muscle alone failed to respond to faradic currents. Taylor says that the reflex will remain if the vastus internus muscle escapes paralysis.

As already stated, the disease tends toward spontaneous improvement, and this may be furthered considerably by judicious orthopedic

FIG. 88.—THE "HIT OR MISS" PARALYSIS OF ANTERIOR POLIOMYELITIS. There a typical flail-like paralysis ("flaccid") of the right leg. Both the leg and thigh exhit atrophy; but both knee-jerks are absent, and the plantar arch is broken down in the le foot. The patient had not learned to walk one year later.—(*Philadelphia General Hospita*

ement. It is often stated that all of the recovery which will lace, will take place in a year's time. Such a statement should ved as very far from the truth. Functional improvement may ıe for many years.

ophic changes have been mentioned. Vasomotor changes are observable in the paralyzed parts—the color of the skin, par-ly toward the periphery of the limb, being blue and the surface ature cold. Edema is sometimes present.

e sphincters are rarely affected, and when they are, the dis-ces are usually transient. Nevertheless, we have seen one case actable enuresis in the subject of infantile paralysis.

e resulting deformities have been very thoroughly described by (Modern Clinical Medicine). For a complete analysis of them ıst refer the reader to his article, or to standard works on ortho-. We shall simply cite them here: Torticollis paralytica (rare); is; paralytic scoliosis (the convexity usually directed toward und side); the paralytic loose joint at the shoulder; anomalous ıns at the elbow-joint (infrequent); paralytic contractures of the ; loose socket of the hip-joint, possibly leading to paralytic ıtions; deformities at the knee-joint (genu recurvatum or flexor cture); paralytic foot deformities (pes equinus, flat foot and calcaneum or cavus). The last-named deformities of the foot ıkle are very common.

rely, particularly in epidemics, cases are observed that appear to r completely, without weakness or deformity. We have seen both the myelitic and polioencephalitic types. More commonly complete recovery, however, we observe almost complete func-restoration, with a somewhat shrunken limb.

agnosis.—At the onset of the disease, poliomyelitis is most lt to diagnosticate, unless one's suspicions are aroused because existence of the disease in epidemic form. Flexner has called ion to important early changes in the cerebrospinal fluid. As , the fever, pains and sweats, may strongly suggest acute articular ıatism. The practitioner should remember, however, that the disease is exceedingly rare in infancy or very early childhood. all conditions, when the mentioned symptoms are present, ıuld keep in mind the possibility of infantile paralysis. He is ıore likely to discover the resulting paralysis sooner. Text-books ı great deal of the differentiation between infantile spinal paralysis ıfantile cerebral palsies. The distinction should not ordinarily difficult. Sachs has contributed the following valuable summary:

Acute Spinal Paralysis	Acute Cerebral Palsy
Onset sudden, with fever, coma and convulsions. Convulsions rarely repeated after a few days.	Onset sudden with fever, coma and convulsions. Convulsions apt to be repeated.
Paralysis flaccid, associated with atrophy.	Paralysis spastic, associated with rigidity and contractures.
Paralysis widely distributed, possibly involving all extremities, or narrowly limited to one member or even a single group of muscles.	Paralysis generally hemiplegic, sometimes diplegic or paraplegic. Monoplegia rare.
Electric reactions altered (R. D.).	Electric reactions normal.
Deep reflexes diminished or lost.	Deep reflexes exaggerated.
Intellect never permanently involved.	Intellect often involved.
No epilepsy.	Epilepsy frequent.

From multiple neuritis, the diagnosis may be extremely difficult; but barring postdiphtheritic neuritis, multiple nerve inflammations are rare in childhood. Again, postdiphtheritic paralysis affects by preference certain parts (throat, eyes and legs) and is painless in its character. Multiple neuritis is usually slower in its course and more progressive in character, while its involvements are symmetric.

To the unwary, scurvy may present great difficulties. It occurs at the same age (six to eighteen months). But in scurvy we find not a paralysis, but a false paresis dependent upon pain. The tenderness of the affected limb, and often the subperiosteal swelling, are disclosed upon careful examination. The absence of fever, the characteristic dietetic history, the existence of stomatitis, and often the existence of hemorrhages elsewhere, are all characteristic of Barlow's disease. In one of our cases of scurvy there was marked atrophy.

Syphilitic epiphysitis usually occurs at an earlier age—within the first two months of life. Once more there is a pseudoparesis dependent upon pain, and examination of the baby reveals other luetic processes.

From joint affections, either acute (septic) or chronic (tuberculous), poliomyelitis should readily be distinguished. Though atrophy may appear, particularly in chronic cases, muscular rigidity and muscular spasm are present in the neighborhood of the affected joints.

Prognosis.—This must be viewed from two standpoints: 1. The danger to life during the acute inflammatory process. 2. The resulting paralysis and the degree of disability.

1. In epidemics of poliomyelitis the danger to life seems greater than in endemic cases. Nevertheless, in the absence of widespread lesions, and in the absence of bulbar involvements, most patients survive the acute attack even during epidemics.

2. The paralysis once established, we may nearly always predict considerable improvement despite initial involvement of many muscles. Nor need the functional improvement cease after the expiration of a year. Our prognosis must not be too roseate, however, until sufficient time, the best determinor shall have elapsed. Electric studies, as we have indicated, may prove of great service in predicting what muscles will eventually functionate. In a word, do not predict too much, but work hopefully, and inspire a sane spirit of optimism in those who are daily associated with the patient.

Treatment.—Unfortunately, we do not know how much our best efforts may avail in the stage of onset, even though we stand on guard from the very first. Rest in bed during the febrile stage, the judicious employment of laxatives, the use of readily digested and easily assimilable foods, all suggest themselves as rational measures. Ice may be applied to the spine, or we may employ dry cups. Urotropin has been suggested by high authorities, and formaldehyde has been recovered from the cerebrospinal fluid when this drug has been administered internally. We used it in one of our worst cases, the little girl of nine years, whose case has been mentioned. Seemingly it had little effect, even upon the acute process. In another case, one of polioencephalitis, the boy made a prompt recovery and the after-paralytic effects were negligible. Occasionally the drug produces hematuria or marked vesicle irritation. Experience with this drug is yet too limited to render a judicial verdict; but we deem it worthy of thorough trial, and shall continue to use it. Ergot is probably valueless, and conceivably may prove harmful.

There is little doubt eventually that a curative serum will be evolved (one is now on trial); but *a priori*, it would appear that its usefulness would be confined to prophylaxis in exposed children, and to early cases before the onset of paralysis. Unless we reach a stage of bacteriologic certainty, its results may therefore always be open to question. When the paralysis first appears, the affected parts should be enclosed in cotton wool, and protected from movement. After the elapse of a fortnight our indications are perfectly clear: 1. The maintenance of nutrition in the affected parts. 2. The prevention of deformity.

Despite the fact that trophic cells are possibly wiped out, much may be done to maintain nutrition. The principal measures to be employed are massage and passive motion, hydrotherapy and electricity. In following out these principal measures, it must ever be borne in mind that we are striving to improve the nutrition of affected muscles or groups of muscles, not of their healthy antagonists. Orthopedists may

justly complain that we but serve to accentuate deformities if we fail to be guided by this principle. Stroking, grasping and striking movements should be practised in massaging the paretic or paralyzed muscles. Warm baths, with volitional movements practised under water, are useful at first. Later we may employ cold douching, or the alternate use of the hot and cold douche. The electric treatment should be with a galvanic current at first, and should be carried out by an expert. In later treatment, faradism may play a useful rôle. Bier's passive hyperemia is a measure that promises much.

Much may be done to prevent crippling contractures from the very first, and most will be accomplished when the nature of these contractures is appreciated. (See Hoffa). Splinting may be all that is necessary at first; but when the patient is gotten up, even the most helpless case may be so aided by skilfully applied apparatus that he or she may walk.

Orthopedics has accomplished noble work in poliomyelitis, and will unquestionably accomplish much more in the future. We cannot go into these matters fully, for they belong to orthopedic surgery; but aside from skilfully applied apparatus, proper shoes, etc., we must mention the importance of the splendidly conceived procedures of nerve transplantation, tendon transplantation, tendon shortening and elongation, arthrodesis shortening of the stretched joint capsules (Dr. Thomas's operation on the shoulder-joint), etc. Above all, we must again endorse the "never say die" motto as a guiding principle in treatment, not only for a year but for many a year.

Friedreich's Disease

Synonyms.—Friedreich's Ataxy; Hereditary Ataxy or Ataxia; Hereditary Cerebellar Ataxia (Marie and Nonne)

The disease was first described by Friedreich of Heidelberg in 1861. Friedreich's ataxy is a familial disease, occurring in childhood, characterized by motor weakness and ataxia, by absent knee-jerks, by peculiarities in speech, by deformities of the spine and feet, and by nystagmus.

Etiology.—The family tendency is well manifested, and the disease may extend through several generations. The usual age of onset is between six and ten years, though absent knee-jerks have been found earlier than this, and the cerebellar ataxy (type Marie) does not appear until after twenty years. Boys only or girls only may be affected in a given family; but statistics reveal the equal susceptibility of the two sexes. Transmission on the maternal side is more common because of

the early loss of sexual sense in the male. Alcoholism and syphilis have been revealed in some family histories, but it cannot be said that either is responsible for the disease. The onset of the malady has also rather closely followed some infectious disease, such as smallpox, diphtheria or scarlet fever. It is almost certain that we are dealing with another endogenous family disease in which the nervous system is literally predestined to develop only to a certain stage (abiotrophy).

Pathology.—The cord as a whole is often very small. In Friedreich's type, the posterior columns of the cord, and often the lateral columns, exhibit widespread sclerotic changes, in some instances, the anterior columns are similarly involved. On the other hand, the fibers of Lissaur's tract usually escape. (An important distinguishing feature from locomotor ataxia.) The cells of Clark's column may be few in number or may have disappeared. In cerebellar ataxia (Marie, Nonne, etc.), the cerebellum is very small, and the cells of Purkinjie are much reduced in number. It is only just to add that different as Friedreich's ataxia and hereditary cerebellar ataxia may appear clinically, pathologic changes have been found in many cases that seem to show a close relationship. In other words, spinal and cerebellar changes have been noted in varying degrees in different cases.

Symptomatology and Clinical Course.—We shall first describe Friedreich's ataxia, what we may designate as the spinal form, and shall then strive to show how the type of Marie (ataxia hereditaire cerebelleuse) differs from it:

The age of onset (six to ten years) has been mentioned. Usually, the first symptom noted is awkwardness of gait. The patient tends to stumble and to come down on his heels. If we study his knee-jerks, we usually find them absent. He stands with his feet far apart, and his gaze fixed upon the ground (attitude of preoccupation). His arms are not affected until a later period—usually after several years. Then, in addition to weakness, there is usually a coarse tremor of the hands. It is not an intention tremor, however. The small muscles of the hand may atrophy and occasionally the bird-claw-hand (main-en-griffe) results. Before the changes in the upper extremities have appeared, however, certain peculiarities in speech have usually been noticed. The most marked one is a tendency to clip the syllables short, thus giving an explosive character to speech. Even when the patient is seriously handicapped in his vocal expression, it is not to be assumed that his mind has necessarily suffered. Indeed, aside from increased emotional displays, the intellect remains normal. One evidence of emotional disturbance is observed in the sudden explosive laughter to

which so many of these patients give vent. The ocular phenomena are very different from those of locomotor ataxia. The Argyll-Robertson pupil is not seen, and optic atrophy is rare. On the other hand, nystagmus or slighter nystagmoid twitchings are commonly observed. The lightning like pains of locomotor ataxia are not experienced, though some of the patients complain of slight cramp-like sensations. Indeed, sensory symptoms of any kind are uncommon. The sphincters usually escape—the most that is observed being an occasional slight difficulty in starting the act of micturition.

The disease is usually characterized by the presence of deformities of the foot, spinal column, or both. The foot is well described as the "hump-foot" (pes cavus). The deformity usually begins with hyperextension of the great toe. Then the arch of the foot becomes elevated and by and by all the toes are hyperextended. The characteristic spinal deformity is a lateral curvature.

Succinctly, the cerebellar type of the disease differs in the following respect: Later onset (twenty years or beyond); more marked ataxia in gait and station (titubation, reeling or drunkard's gait); more jerky and explosive speech (with low, guttural monotonous voice); more marked tremor, often almost choreiform movements; overaction of various facial muscles; more frequent optic atrophy, and various ophthalmoplegias.

In either type, the disease tends to progress slowly and steadily from bad to worse, the patients eventually becoming bedridden and helpless.

Diagnosis.—Locomotor ataxia is rare in early life; is probably always syphilitic in origin; exhibits early the lightning pains, and presents Argyll-Robertson pupils and optic atrophy. Sphincter disturbances are also common. Multiple sclerosis, very rare in children, if indeed it occurs at all, is accompanied by intention tremor and scanning speech. Cerebellar tumor presents general symptoms (see brain tumor), and is more rapid in progress. Occasionally we may have to differentiate between this disease and hysteria.

Prognosis.—This is bad so far as eventual results are concerned; but we may predict a slow progress of the disease. It may be a number of years before the patient becomes bedridden, and then he may live for many years more—attaining middle age, or in the cerebellar type, even old age. Death is likely to result from some intercurrent malady, usually some pulmonary disease.

Treatment.—This is inefficient. Plenty of sunlight and fresh air, good food and tonic treatment are our principal resources. Every-

thing possible should be done to educate the young patients, and amusement and occupation should be furnished for both the children and adults afflicted with this disease. Fraenkel's movements may prove of some service.

Juvenile Locomotor Ataxia

Like juvenile paretic dementia, this is a rare disease of childhood. Indeed Collins considers it one of the rarest nervous diseases of early life.

Etiology.—Nearly always there is found a history of inherited syphilis or else evidence of parental or hereditary syphilis is revealed in a study of the other members of the family. James Taylor quotes some splendid illustrative cases. The disease may be viewed as definitely due to inherited lues.

Pathology.—Little is known of this, though it is assumed that the disease is dependent upon posterior sclerosis, as it is in adult life. Collins calls attention to the fact that syphilitic meningitis over the posterior regions of the cord, or areas of multiple sclerosis occurring in the columns of Goll and Burdach may occasion indentical symptoms. He thinks the disease a direct manifestation of syphilis, rather than a para syphilitic disorder as it is often styled in adult existence.

Symptoms and Clinical Course.—The disease may occur as early as eight years of age or as late as twenty-three years (Taylor). One of us studied a child of four years who presented Argyll-Robertson pupils and absent knee-jerks. There are two distinct types—one beginning with severe lightning pains; the other with optic atrophy. In both, diminished or absent knee-jerks, ataxia, pupils immobile to light and urinary incontinence appear sooner or later. The affected child may exhibit indubitable evidence of hereditary lues, or other children in the family may show such somatic signs. In at least two of the reported cases the father was a tabetic. The disease is closely related to juvenile paretic dementia. One of Taylor's cases first evidenced symptoms and signs of locomotor ataxia; but later he developed slurring speech and mental exaltation, and had to be committed to an asylum. So the paretic dement of early life may later on develop symptoms of juvenile locomotor ataxia.

Diagnosis.—This is constructed from the same symptoms and signs that characterize the disease in later life: The pains, optic atrophy, Argyll-Robertson pupils, involvement of the sphincters and possible mental phenomena, readily distinguish it from Friedreich's ataxia. In multiple sclerosis (another rare disease) the intention tremor appears sooner or later.

Prognosis.—This is distinctly bad, though the disease may show remissions and exacerbations. It is usually more rapid in its course than Friedreich's ataxia.

Treatment.—Syphilitic medication should be tried, though it usually proves inefficient. Mercury should be given in large doses at intervals, and the iodids continuously. We should feel inclined to use salvarsan in one of the patients. Fraenkel's movements should be tried, as in older patients and as in Friedreich's ataxia (Collins).

DISSEMINATED SCLEROSIS

Disseminated, multiple, insular, or cerebrospinal sclerosis is a disease of early life, characterized by a definite set of symptoms consisting of tremor, difficult deliberate speech, ocular symptoms, and a peculiar gait, but with great variation in the phenomena. Anatomically, areas of sclerosis of varying sizes are found scattered through the brain and cord.

Etiology.—Disseminated sclerosis in children occurs most often as a sequel of the infectious diseases, after traumata, overwhelming emotion, or possibly following metallic poisoning. It is more common in adolescents, and very rare in children. It is much more likely to arise in those of neurotic heredity, and is oftener met in Europe than in this country.

Pathology.—In disseminated sclerosis there are found plaques of sclerotic tissue distributed irregularly throughout the greater part of the central nervous system. These patches of firm gray tissue appear in the brain as well as in the spinal cord, and may appear first in the one or the other. Whether the hardening shows in the nervous centers or in the fibers emerging from them, the character of the changes is much the same, the important point to keep in view being that only some, and not the majority, of the nerve-fibers are destroyed, thus producing a perverted action of the whole cerebrospinal system.

Symptoms.—The disease usually begins by a gradual weakness in the arms, fingers, and legs, with irregular pains and stiffness and an intention tremor, increased on effort, gradually increasing. This tremor subsides when the parts are at rest, becomes marked on exertion, and grows worse under coordinate acts and excitement. It often increases in intensity and extends to the legs, producing great difficulty in locomotion. The articulation becomes deliberate—"scanning speech," pronouncing each syllable slowly and laboriously, like a child reading from a primer. There may be a distinct vibratile quality

of the voice. The tremor at times affects the muscles of the eye, producing a nystagmus which is increased by looking forcibly to right or left; the field of vision is narrowed, the color-fields altered, quite similar to the changes produced in hysteria. The tongue upon protrusion also exhibits a tremor, and the expression of the face becomes stupid and uncertain. The mental condition, especially memory, is impaired, and the sufferer is exceedingly emotional, especially when the disease has begun early in life.

The paralysis is of the spastic order, showing in the gait a dragging, shuffling, springy motion of the legs (causing the shoes to wear through quickly in the toe part of the soles), due to rigidity and contractures. Athetosis is not uncommon. The deep reflexes are increased, and the muscles become rigid. These phenomena may remain much the same for a long period, and yet tend finally to grow worse. The memory weakens, speech becomes unintelligible, and finally all the voluntary activities fail; sensation is little affected; death usually occurs from some intercurrent disease.

Prognosis.—Multiple sclerosis is a chronic disorder, and induces death more by depreciating the entire organism and by adding an element of peril through increasing susceptibility to disease than by itself terminating life. If the vital centers are affected, death may be caused by this process directly. The progress is slow and quite incurable, but may in some instances come to a standstill for years. We have had under observation a family of many children in which three, and possibly four, are affected by this disease, and from a very early age. One of these, a boy, served us in the capacity of errand boy for some months. They are all still living, though the oldest sufferer, aged about twenty-three, is now bedridden.

Treatment.—The disease is quite incurable, but many measures are of distinct value in enhancing the comfort of the sufferers. Prolonged rest, with systematic hygienic measures, benefits exceedingly. The process is very exhausting to the victims. There is a perpetual unrest, which needs to be met by unremitting reparative measures. Sleep is oftentimes much disturbed, and tepid baths at night contribute largely toward general contentment. Cool and colder douches are useful during the day, or the drip sheet, the patient standing in warm water. Electricity is of little use to the muscles—the constant current is valuable applied to the spine. Mild galvanism moved up and down the back may be tried more hopefully. Manipulations of the limbs will do much toward relieving the contractures. It should be borne in mind that in giving massage to spastic limbs, slow, firm movements

are best; also, as demonstrated long ago by Mitchell, overextensi of the limbs tend to overcome contracture, lessen tremor, and m the parts more elastic.

Medicinal.—Iodids and mercury have not the slightest eff but arsenic is recommended, and a prolonged course of nitrate silver may be tried. For the tremors, bromids, hyoscin, hyoscyan gelsemium, cannabis indica, and belladonna, exert some relief.

If contractures become extreme, and especially if they imp locomotion by malposition of the feet, tenotomy may greatly aid getting the patient to move about with more freedom and ease.

MYOPATHIES

The Muscular Dystrophies (Dystrophia Muscularis Progressiv Erb)

As Gowers states, these disorders were first included ur nervous diseases because of a misunderstanding concerning t origin. Their original describer, Duchenne, regarded them as dep ent upon spinal disease, like progressive muscular atrophy. Bec of the close connections (anatomic, physiologic and clinical) betw muscles and nerves, it is probably just as well that they should be scribed in treatises upon nervous diseases.

History.—This has been splendidly studied by Gowers and oth Though occasional cases and series of cases had been previously scribed (as early as 1830), the first clear-cut and complete descrip was given by Duchenne (1861). The next addition to our knowl was made by Gowers. Erb then contributed his form of musc dystrophy, agreeing with Gowers that the different types were different manifestations of the same disease. Landouzy and Deje then described their facio-scapulo-humeral type. Erb, in a fur study, then reiterated his former conviction. For convenience s we shall adhere to the usual classification, and shall describe the t principal types.

Pseudohypertrophic Muscular Dystrophy (Duchenne's Type)

Synonyms.—PSEUDOMUSCULAR HYPERTROPHY; LIPOMATOUS M CULAR ATROPHY; LUXURIANS MUSCULARIS PROGRESSIVA (HELL

Definition.—This is a type of family disease, usually evidence childhood, in which the subject displays enlargements of certain m cles, despite which his muscular strength slowly and progressi fails.

Etiology.—As already mentioned, the disease usually starts in childhood, and is well advanced when the pubertal period is reached. Nevertheless typical cases occur in adolescence or in adult life. The disease is far more common in boys than in girls; but in some families only boys are affected, in others only girls. Girls are usually affected later in life, and in them the affection is not so severe (Gowers). Inheritance always takes place along the maternal side of the house, the mother who transmits it being free from the disease. This disorder is another example of a develop-

FIG. 89.—PSEUDO-HYPERTROPHIC MUSCULAR DYSTROPHY. The pseudo-hypertrophy of the calves and hamstring muscles is marked. The boy also rises from the floor in the pathognomonic manner. The supra- and infraspinate muscles are affected, and he has pronounced lumbar lordosis. The photographs were furnished through the courtesy of Dr. Keech.—(*The St. Christopher's Hospital for Children.*)

mental disease, in which at a certain period of life the muscle-cell is literally doomed to degenerate (abiotrophy).

Pathology.—Certain muscles may be congenitally absent or partially deficient from the first (Gowers); such are the pectoralis major and the latissimus dorsi. The affected muscles are usually atrophic when death takes place. Muscle fibers are found by the microscope, but they are few in number and vary in size more than they do normally. Some are found to have undergone hyaline degeneration. It is in the interfibrillar structure that the most marked

changes are observed. Here we find either fibrous tissue or fat. In the enlarged muscles, fat predominates. Gowers has likened the appearance to that of a myolipoma. The nerves are unchanged. In some cases, certain changes (small cavities, etc.) have been noted in the spinal cord, but these are in nowise constant, and probably have nothing to do with the disease *per se*.

Symptomatology and Clinical Course.—The first symptoms to attract attention are awkwardness and weakness. The latter is particularly noticeable when the subject is going up stairs or is rising from the recumbent posture. If examined at this time, the child's calves will probably seem unusually large and firm, in striking contrast to their obvious weakness. Other muscles which may show enlargement are the infraspinati, supraspinati, deltoids, triceps, biceps and glutei. The latissimus dorsi and pectorales never enlarge, but are often strikingly small. The thighs are usually small in contrast to the calves, but are occasionally enlarged. The small muscles of the hand are only involved in rare instances. The muscles of the shoulder-girdle are more liable to be atrophied than enlarged, and in the former instance, appear in striking contrast to the hypertrophied (?) infraspinati. The tongue is often large, and may display prominent papillæ.

The child's method of rising from a recumbent position is almost pathognomonic. He rolls over on one side, and gradually gets on all fours. Then he extends the legs on the thighs, standing like an anthropoid on feet and hands. The hands are then brought nearer and nearer to the feet. Next, one hand is placed above the corresponding knee, the other hand soon following it and being placed above the opposite knee. Then, by the use of his hands, alternately grasping higher and higher levels on the respective thighs, the patient climbs up until the upright position is finally attained. This interesting, well-nigh pathognomonic, series of manouvers may be observed in all stages of development in different patients. The description given is that of a well-marked case (see Figs. 89 and 90). The gait is graphically described as "waddling." The patient poises on one foot, so that the other may be swung to an advanced position; his body then swings to the other side, as his center of gravity changes, and he balances on the other foot. There is usually marked lordosis, and the shoulders are held far back. A line dropped from the scapula falls well behind the sacrum. The method of arising from the floor, the "waddling" gait and the lordosis, are all dependent upon weakness of the extensors of the thigh. The trunk muscles are also weak, and so are the arms. The weakness progresses slowly but surely. When the arms have

very weak, the patient can no longer arise from a recumbent ng posture. At first, the deep or tendon reflexes, as exemplified knee-jerk, are normal; but subsequently they weaken and even-

—Rising from the Floor. Pseudo-hypertrophic Muscular Dystrophy.—(*Courtesy of James Carmichael, Edinborough, Scotland.*)

may be lost. Electric reactions are also normal in the early . Reactions of degeneration do not appear; but gradually the lar response to both currents becomes more and more feeble.

Contractures of the calf muscles may take place, leading to pe equinus. Contractures may also appear in the upper extremities, an so may deformities of the spine. There are no fibrillary contraction in the diseased muscles; but athetosis and Thomsen's disease hav been noted as complications. The tongue is often thickened, and may reveal enlarged papillæ. Mentality may be normal; but on the other hand, many of these children seem notably backward in develop ment, while some are markedly deficient mentally.

Rarely, patients may evidence all of the symptoms here described, except the pseudohypertrophy. By some such cases would be desig nated examples of the hereditary form of Möbius and Leyden.

Diagnosis.—With care, this presents few difficulties. The enlarge muscles, the method of rising from the floor, the gait, the posture, th atrophy of other muscles, all combine to furnish a striking symptom syndrome. The absence of reactions of degeneration and of fibrillar contractures, and the rarity of envolvement of the interossei, form im portant distinguishing features from progressive muscular atrophy o spinal origin.

Prognosis.—The course of the disease is usually slow. But tends downward toward eventual helplessness. Death may resu from some other malady, notably from some disease of the chest. A mentioned, the progress of the disease may be much slower in girls

Treatment.—Nothing that is known avails. Massage has seeme of value at times, appearing to effect temporary improvement in some cases. Arsenic has seemed of benefit to some of these children Thyroid may lessen the size of the tongue, but its internal employ ment seems to do no other good. The little patients should receiv such educations as may render their helpless lives bearable.

The Juvenile Form of Myopathy (Erb's Type—The Scapulohumeral Type)

Etiologically, this type does not differ from that just described except that it tends to occur at a later period of life. It's subjects are usually attacked at or beyond the age of puberty.

Symptomatology.—The affected muscles are those of the shoulder girdle—the pectorals, the serati, the trapezii, etc. Later the biceps and other muscles of the arm may be affected, or the disease may involve the muscles of the back. The deltoids often appear hyper trophied, and other muscles may exhibit this pseudohypertrophy.

The Infantile Type of Landouzy and Dejerine

Synonym.—THE FACIO-SCAPULO-HUMERAL TYPE OF MYOPATHY

This, as the term applies, appears at an earlier age than Erb's type. Otherwise, it may be regarded as corresponding clinically to that variety, with the additional involvement of certain muscles of the face. Indeed, the face becomes first affected. The orbiculares palpebrarum and orbicularis oris are usually the most affected muscles. The subject of the disease is unable to close his eyes completely or to pucker his mouth when he tries to whistle, etc. The characteristic "mask-like" expression thus obtains. Sometimes the lips are thickened, and then we have the appearance of the "tapir-mouth." Weakness of the tongue and of the palatal muscles has also been observed.

The Neuritic Type of Progressive Muscular Atrophy

Synonym.—THE PERONEAL TYPE (CHARCOT-MARIE AND TOOTH)

Etiology.—This is another disease of the family type. It usually appears late in childhood or in adolescents.

Pathology.—This is still a matter of dispute. Tentatively, it may be viewed as an intermediate link between the forms just described and the progressive muscular atrophy of adults and of early existence (myelogenic).

Symptomatology.—Weakness and atrophy first appear in the peroneal group of muscles, then in the calf. The disease may cease here, or subsequently it may involve the muscles of the thighs, arms and hands. The patients exhibit the "stepping-gait" (steppage). Deep or tendon reflexes lessen in intensity, and are later lost. Electric reactions are variable, but those of degeneration usually appear. Fibrillary twitchings in the affected muscles are the rule. Various sensory phenomena have also been noted: Pain; hyperasthesia; hypo- or anesthesias and analgesias. Vasomotor phenomena have also been observed in some cases. The disease usually progresses very slowly—frequently by exacerbations. In some patients, it never passes beyond the muscles initially affected.

Diagnosis.—The muscles involved, the fibrillary twitchings, the reactions of degeneration, the sensory phenomena, etc., usually serve to distinguish this disease from the myopathies or dystrophies.

Prognosis.—As stated, the disease tends to slowly progress by periods of advance and pause.

Treatment.—Massage is said to be the only thing that does any good.

Early Infantile Spinal Progressive Muscular Atrophy (Myelogenic Type)

This was first described by Werdnig, and later was placed on a firm basis by the writings of Hoffman.

Etiology.—It is clearly a familial disease, nearly all the cases (thirty) having appeared in branches of the same family (Zappert). It has been traced through several generations. Its victims are usually attacked in the latter half of the first year.

Pathology.—Atrophy of most of the cells of the anterior cornua, degeneration of the motor fibers, and pronounced muscular atrophy are the morbid anatomic lesions of this disease.

Symptomatology and Clinical Course.—Infants of the age mentioned develop weakness of the legs and back, then of the muscles of the neck and shoulder. The disease spreads, until finally the hands and feet are involved. The muscles become much wasted, though rarely they are said to exhibit pseudohypertrophy. "Fibrillary twitching is not constant." The electric reactions are those of degeneration. The sensorium, the cranial nerves and speech development remain unaffected. A fatal termination ensues in from one to four years, usually from some pulmonary disease.

Diagnosis.—Should the medical attendant possess knowledge of the existence of this rare disease, he can scarcely confuse it with any other affection. In amaurotic family idiocy, the sensorium and vision are so markedly affected that it could scarcely be mistaken for the disease under consideration.

Treatment.—No treatment has been found to be of any avail.

DISEASES OF CRANIAL AND SPINAL NERVES

Facial Paralysis

Synonym.—Bell's Palsy

Etiology.—This affection may result from a number of causes. Under the caption of obstetric paralysis, we have already spoken of the type resulting from a peripheral birth injury. Cold is another cause that may influence the facial nerve after it has left its bony canal, and mumps is another. Middle-ear disease is far and away the most com-

e of involvement within the canal (see Fig. 92). Within
m, the nerve may become diseased under a number of con-
ch as brain tumor, meningitis, infantile paralysis (of the
halitic type), infantile hemiplegia, etc.

ogy.—This involves the conditions that occasion the disease
nth nerve, and also the various situations at which the nerve
tacked.

omatology.—The symptoms are motor, vasomotor, secre-
ic, gustatory and auditory. They will depend upon the
the nerve attacked by inflammation, etc.

—FACIAL PARALYSIS (OB-
The photograph was taken
r delivery with forceps. On
day, the left hemi-paralysis
ly disappeared.—(*Philadel-
Hospital.*)

FIG. 92.—RIGHT FACIAL PARALYSIS (BELL'S PALSY) FROM OTITIS MEDIA WITH MASTOID INVOLVEMENT.—(*Courtesy of Dr. George B. Wood.*)

eral Involvement.—The muscles of the forehead and
eye are affected with the other facial muscles. The mouth
is usually drawn to the unaffected side. The facial lines
cted side are smooth; the patient is unable to close the eye,
run down over the cheek. Sucking and mastication are
with; the latter because food accumulates between the teeth
. Whistling becomes an impossibility. Articulation and
may be interfered with in bad cases. When the subject
cries (see Figs. 91 and 92), the differences in expression

between the two halves of the face become much accentuated. Vasomotor paresis or paralysis and trophic changes may also be in evidence. Electric responses will depend upon the amount of damage done, and may be important prognostically.

Involvement Within the Canal.—Often we have ample evidence before us of otitis media or mastoid disease. The symptoms are the same as those above; but we may also have interference with the sense of taste and with salivation. Deafness may result, either from the causative process (otitis, etc.) itself, or from nerve involvement before the seventh and eighth nerves part company.

Within the Cranium.—Brain tumor, and other processes at the base of the brain, almost uniformly involve the eighth nerve when they affect the facial. Thus in one of our cases of brain tumor, nerve deafness preceded the facial paralysis by at least two years. On the other hand, gustatory sense probably escapes under these conditions. If facial fibers are affected above the nuclei of origin of the seventh cranial nerves, the muscles of the forehead escape, and electric reactions of degeneration are absent.

Diagnosis.—With care, this should give little trouble. To be accurate and complete, however, the diagnosis should attain a knowledge of cause, of the site affected and of the amount of damage done.

Prognosis.—In peripheral affections, this is usually good, unless reactions of degeneration be present. Inflammation from middle-ear disease is exceedingly liable to cause permanent paralysis. The nature of lesions within the cranium may render recovery impossible. On the other hand, we have seen complete recovery after polioencephalitis. Drs. Roxby and Alger saw three cases of facial paralysis at Swarthmore and its vicinity, in the summer of 1910. One of us saw two of these patients. The third one promptly developed symptoms of bulbar palsy and died. The others made perfect recoveries.

Treatment.—Obstetric paralysis of this type usually gets well without treatment. If cold seems to be the responsible agent, the salicylates seem almost specifics. We believe too in the efficiency of a blister at the tip of the mastoid under these conditions (cantharis collodion). Mumps, we always treat by painting guaiacol (5 per cent.) and ich disease should be promptly recog same must be said of mastoid adults, is hard to use on chi cases.

more encouraged in the young than might be supposed, affecting not only the peripheral nerves, but producing destructive changes in the liver, kidneys, and brain. Moreover, the appetite for alcohol in children is sometimes not wanting. Alcoholism and tuberculosis in the parents are said to be predisposing factors. Injuries of nerves by fracture, wounds, blows, and direct pressure are followed occasionally by neuritis.

Morbid Anatomy.—In neuritis the changes are chiefly interstitial or parenchymatous, the perineurium usually escaping, and the damage is confined to the peripheral nerves. In some instances the nerve is swollen, infiltrated, and its sheath hyperemic, of a red color, and covered with minute hemorrhages. Sometimes the muscular tissue is involved, the fibers being smaller and paler, the changes there being both parenchymatous and interstitial. One of the most striking peculiarities of the phenomena of multiple neuritis is the fact that the toxins select the peripheral nerves and allow the spinal centers to escape.

The resistance of the more remote nerve-fibers appears to be lessened the further away they are from the mother cell.

Symptoms.—The first symptom of a multiple neuritis resembles an acute infectious disease. There are usually a chill, pains in the back and limbs or joints, simulating acute rheumatism, rapid rise of temperature, 103° to 104° F., headache, loss of appetite, coated tongue, constipation; locally, pain, numbness, and tenderness. "The most characteristic feature of multiple neuritis is the association of motor paralysis with sensory paralysis—the distribution of each harmonizing with the other and showing very definite anatomic limits. The paralysis is of the flaccid order, leading at an early date to atrophy of the muscles, and the electric conditions are so altered that we may find almost every possible form of the reaction of degeneration, from a mere loss of faradic irritability to an absolute lack of galvanic response on the part of the nerves and muscles. The distribution of the paralysis is, as a rule, entirely symmetric, and may affect either the upper or lower or all four extremities; it may involve every part of all the extremities, and is the one affection which, perhaps more frequently than any other, leads to a complete paralysis of every limb of the body" (Sachs).

The characteristic phenomena of the disease are wrist-drop and foot-drop, due to the greater disturbance of the extensor muscles. Sensory symptoms accompany the paralysis, and where pain continues to persist in the muscles and along the nerve tracts, the diagnosis

points more to multiple neuritis than to a central trouble. Absence of pain does not impair the diagnosis of multiple neuritis—motor and sensory paralysis is more slowly developed than in central affections, and there is more likely to be premonitory paresthesia. Sensory impairment is pretty equally distributed; at first there may be hyperesthesia. Later, pain may continue, and finally the sense of pain be lost along with the muscular and temperature sense. Tremor and incoordination are frequently associated in neuritis with the loss of sensation and power. Station may be imperfect, the sway excessive, or total inability to stand if the eyes are closed. The reflexes in the affected limbs are diminished or absent, especially the knee-jerk. The parts affected first are the ends of the extremities, and a weakness very early attacks the extensors of the toes, making it difficult for the patient to extend the foot in walking. The muscles supplied by the anterior tibial nerves are the most frequently affected in multiple neuritis, as well as in poliomyelitis, and in the arm the muscles supplied by the musculospiral nerve. The nerves supplying the muscles of the trunk are very rarely affected. The sensory changes are about equally distributed. Pain and paralysis are the distinguishing symptoms of multiple neuritis, but occasionally the one or the other is absent, or, in the case of pain, may have been transient. Electric reactions are extremely varied, both in character and degree. An important point is the early atrophy, also the absence of disturbances of the bladder and rectum. Glossy skin and edema, common in diseases of the peripheral nerves, are present in many cases, and the peculiar tapering of the fingers. The course of multiple neuritis varies with the intensity of the cause, the symptoms, as a rule, increasing during the first five or six weeks, then diminishing. Both sensory and motor symptoms increase together, and then the sensory symptoms rapidly lessen, he motor phenomena more slowly; this last is due to the atrophy of he muscles and consequent contractures. As the severity of the symptoms subsides, even in the worst cases, recovery is usually steady and omplete.

Diagnosis.—The characteristic feature of disease of the peripheral erves is the close association of sensory with motor phenomena, indiating an involvement of the same nerve areas. Also there are usually ot only subjective sensations of pain, but tenderness along the affected erve tracts. In poliomyelitis the onset and course are more abrupt id violent, and the central nervous system shows wider evidence of sease, and the paralyses are likely to be more one-sided; in neuritis, ore symmetric. In poliomyelitis there is rarely much tenderness

along the nerve tracts; as a rule, the pains are vague, but liable to be very severe in the early course of the disease. The electric reactions are very similar. Moreover, the two disorders may coexist. At all times the differential diagnosis between these two is difficult. The most important point is to recognize the special cause of the neuritis. Landry's paralysis begins in the legs, first one, than the other, then spreading to the upper extremities. In America, Sachs tells us, the most frequent cause will be found in a preceding acute infection—either by poisoning or by the toxic principles produced in the acute infectious fevers; next in frequency is malaria, and, lastly, tubercular, syphilitic, alcoholic, metallic, or other poisoning.

Treatment.—The treatment of multiple neuritis consists primarily of rest in bed and the removal or limitation of the cause, which is usually a definite one—septic, metallic, or malarial. During the height of the malady the sensory symptoms, particularly pain, require alleviation, and for this heat or alternate heat and cold are best. Next comes the upbuilding of the general health by general hygienic and tonic measures, and finally the repair of the paralyzed nerve and muscle. Warm baths, systematically and frequently given, are useful in most cases to produce a variety of results—relief of painfulness and restlessness, stimulating or tranquilizing effects upon the circulation, and aiding in securing sleep. If the pain is excessive, small doses of analgesics are suitable, of which the best is opium or the coal-tar preparations, used with caution. The salicylates are not particularly useful. Chloral or strontium bromid by the rectum is sometimes of value. Where the nerve sheath is involved, mercurial inunctions have been used with success, either the unguentum hydrargyrum or a 5 to 15 per cent. ointment of the oleate of mercury. Arsenic is positively dangerous. In the majority of cases general tonic remedies will be sufficient—cod-liver oil, quinin, and strychnin. In the malarial form quinin is necessary as a specific, with perhaps minute doses of calomel to aid its action. When the paralytic symptoms appear, the galvanic current is useful both as a sedative and tonic; when the faradic current produces contractions, it is useful as a muscle stimulant, but is not to be used where there is hyperesthesia. Contractures may be overcome by gentle massage, later by forcible overextension. If these deformities are permanent, tenotomies and orthopedic apparatus are indicated.

Potassium iodid is of service as an eliminant where much perineural exudate exists.

Diphtheric Paralysis

Paralysis, more or less severe, follows a large proportion of cases of diphtheria, and bears no relation to the severity of the attack nor to the previous health of the patient, and may occur within the first week or not until several weeks have elapsed. Diphtheric palsy generally follows a particular order; the palate is usually the first and often the only part affected, shown by the regurgitation of liquids through the nose and a nasal articulation. If this extends, the upper and lower extremities may be affected, at first as a mere weakness and later as a complete paresis, and is generally accompanied by marked disturbances of sensation. The sixth nerve is often affected, supplying the external rectus muscle. Complete oculomotor palsy is rare, but ptosis and weakness of one or more muscles supplied by the third nerve are often seen. The pupillary reaction is often sluggish, with impairment of accommodation. The epiglottis is sometimes paralyzed, and is a source of distinct peril. The reflexes are generally diminished or lost, even in some instances where there is no actual paralysis. Cardiac failure following upon diphtheria, especially where there are irregularities of respiration, is probably due to loss of function of the vagus.

The **prognosis** is distinctly favorable, though the course may be most protracted. Where a single nerve is affected, the recovery is more prompt. Hysteric palsies may be superadded to the original lesion, and this possibility must be carefully considered where the case is long in recovering. A return of reflexes and electric reactions points clearly to repair of the nerve, although the muscle atrophy may prove troublesome.

The **treatment** consists of general measures directed to the repair and maintenance of strength. Feeding should be particularly insisted upon, and where the palate is paralyzed, solids are more easily swallowed than liquids. If the difficulties of deglutition are extreme, the nasal tube should be used, or rectal feeding may be necessary. Upon the slightest suspicion of heart weakness cardiac tonics should be given—digitalis, strychnin, caffein, and hot drinks. For respiratory weakness direct excitation of the phrenic nerves by slowly interrupted faradic currents will give good results.

Lead Paralysis

Occasionally occurs in children, as has been proved by the researches of Putnam, D. D. Stewart, Jeffries Turner, and others. It may be most

important, and should not be overlooked. It usually occurs in the extensor group of muscles of the forearm and legs, producing wrist-drop and foot-drop. There are usually along with this marked cachexia, pallid skin, severe headaches, and digestive disturbances. The prognosis is favorable for the paralysis, but danger exists from profound nutritional disturbances and the effect of the poison upon the brain.

The lead is only occasionally found in the urine, and in minute proportions when present, confirming diagnosis, but when absent not excluding suspicion. A well-marked blue line is only rarely seen, and chiefly when the teeth are foul, collecting in the sulci between them and the gum. It consists of a deposit of sulphid of lead, and forms inside the gum at its extreme edge, and only opposite certain teeth.

The discoloration commences as minute blackish dots, in many cases only distinguishable by the aid of a lens. The absence of these appearances does not negative the suspicion, and the diagnosis must rest on clinical symptoms. These are: (1) Paralysis; (2) colic and muscular pains; (3) convulsions; (4) ocular neuritis; (5) spurious meningitis (Jeffries Turner).

1. *Paralyses.*—The first paralytic symptom is dropping of the toes in walking, the child adopting a high stepping gait to raise its toes from the ground. All paralyses are bilateral. If the disability is of long standing, there may be secondary contractures, producing a talipes equinus. The arms are not so frequently affected as the legs, and usually secondarily. The foot-drop is first to occur and last to recover, when both it and wrist-drop occur.

2. *Colic and Muscular Pains.*—Colic is not rare. Constipation is usually present; vomiting occasionally. The digestive disturbances are cyclic, forming "bilious attacks," and occur once in a month or six weeks. Pains in the legs are frequently present and are characteristic. When severe, the pains are in the nature of cramps.

3. *Convulsions.*—The eclamptic attacks caused by lead occur late and early in the poisoning, and can be differentiated from those caused by other conditions only by collateral testimony. They are severe usually, and accompanied by cramps in the abdomen and legs.

4. *Ocular neuritis* occurs, resembling a meningitis. The phenomena are headache, vomiting, a slight squint, depending upon a paresis of one or both external recti muscles, and optic neuritis. In such a grouping the suspicion of lead-poisoning, Turner says, is most grave. Optic atrophy and blindness often result.

Treatment consists of general measures and the administration of iodids in moderate doses, besides warm baths and gentle massage.

NERVOUS DISEASES OF A FUNCTIONAL CHARACTER—NEUROSES

CONVULSIONS IN INFANCY AND CHILDHOOD

(Infantile Eclampsia)

Etiology.—We shall endeavor to enumerate the causes of convulsions in their chronologic order of occurrence:

1. *Neurotic Inheritance.*—Heridity plays a part in a relatively small percentage of cases. This is derived principally from insane, imbecile, epileptic, hysteric, syphilitic, alcoholic, or tuberculous parents. Probably ancestral gout should also be accorded an etiologic place here.

2. *Intrauterine Affections of the Brain or Circulatory Apparatus.*—Of brain affections, we would mention porencephaly and other gross hypoplastic states, and the less tangible though still potent agenesis corticalis. These conditions have been dealt with in former chapters. Among the affections of the circulation, the numerous forms of congenital cardiac disease take first rank.

3. *Causes Operative at Birth.*—Chief among these is asphyxia neonatorum, with its dire result—meningeal, epidural or subdural hemorrhage. Of less frequency and importance is trauma exerted upon the infant brain. In this connection we need but mention the now classic studies of Petersen and McNutt.

Asphyxia may cause convulsions in the new-born even when no gross brain lesions exist, due, as some remark, "to a supervenosity of the cerebral circulation."

Convulsions dependent upon the second and third causes sometimes occur within the first few days of life, though these motor manifestations of serious lesions may be so slight as to escape any but the most skilled observation. Often, on the other hand, the unfortunate infant is about three months old before his first eclamptic seizure is noted. Generally speaking, a convulsion within the first three months of life should cause the medical attendant to search for some cerebral cause of prenatal or birth origin.

4. *Causes that Operate soon after Birth.*—Atelectasis, the various infections of the new-born, and the hemorrhagic disease of early life are here worthy of special mention. Congenital malformations of the bile passages by inducing hemorrhages in the brain, etc., may also cause convulsions.

5. *The most common cause of eclampsia in infancy is rickets*, or rather the sensitive nervous system of the rachitic child upon which one of the reflex causes operates to produce such lurid motor results.

Chief among this legion of reflex factors we must recognize gastro-intestinal irritation from undigested food, infectious material, foreign bodies, or parasites; dentition; adenoids and enlarged tonsils; middle-ear disease; an adherent prepuce or clitoris; burns; wounds; incarcerated hernia, etc. So simple a surgical procedure as vaccination may induce a convulsion in the susceptible subject, as one of us has on two occasions observed; and even the cry of temper ("holding of the breath spell") may incite such a paroxysm in the predisposed.

6. *The Diarrheal Diseases (Principally Infectious) of the First and Second Years.*—Convulsions may occur in these affections perforce of the profound toxemia and consequent meningeal irritation (meningismus). They occur far more frequently in the latter stages of subacute or chronic ileocolitis, when the so-called hydrocephaloid (hydrencephaloid) state has supervened.

7. *Meningitis.*—Toward the end of the first year of life, and during the second, tuberculous meningitis becomes a fairly common form of tuberculosis, and late in its course convulsive seizures are not infrequent. In other types of meningeal inflammation, notably the epidemic form, the simple basilar type of Gee, the pneumococcic and purulent types, convulsions more frequently initiate the disease or are seen early in its course.

8. *Brain Tumors.*—These are relatively rare causes, but one of us has seen both the tuberculoma and the glioma at autopsy, when convulsions had been present during life. Sarcomata may also cause such paroxysms; nor should one forget the etiologic importance of syphilomata during the second decade of the child-life.

9. *Hydrocephalus*, whether congenital or acquired, primary or secondary, may cause convulsions. This was well shown in the case of Wm. P., twice exhibited by one of us before the Philadelphia Pediatric Society. (See Hydrocephalus.)

10. *Polioencephalitis* (Strumpell), encephalitis or meningoencephalitis, so long denied its place as a disease entity in England and America —denied in particular its etiologic rôle in the production of infantile hemiplegia—is now firmly established in both positions. In most cases this disease is ushered in with convulsions, and in about 50 per cent. of the cases epileptiform seizures persist through the future lives of the patients. We could cite personal experiences with this affection after practically all of the common infectious diseases of childhood.

11. *Poliomyelitis*, though usually distinguished early from infantile cerebral paralysis by its freedom from unconsciousness and convulsions, is not always so characterized. More than this, the two conditions are

ow thought to be but different manifestations of the same disease. A boy sent to one of us by Dr. Carrell, of Hatboro, illustrated this statement beautifully. He was unconscious for three days, but eventually made a complete motor recovery, barring his flail-like left leg.

12. *The Infectious Diseases of Severe Type.*—When such convulsions occur early in an infectious disease, they are usually dependent upon the profound toxemia, but later they may be caused by a complicating middle-ear condition or by an actual meningitis. In pertussis they may also result from meningeal hemorrhage.

The diseases most liable to exhibit convulsions at onset are scarlet fever, pneumonia, epidemic influenza, tonsillitis, and malaria. (Spotted fever has been dealt with under another heading.) Even the ordinarily benign mumps, however, has been so heralded. We cannot agree with the statement so often made in text-books that "convulsions in infancy and childhood often replace the chills observed in later life" at the onset of such infectious processes. We are convinced that such convulsions do not occur from the toxemia *per se*, but that a convulsive tendency must also exist. This was well evidenced in the case of Thomas H., aged seven years. His attack of croupous pneumonia was ushered in by violent convulsions, but he presented a history of infantile eclampsia, and he had worn braces for bowed legs.

13. *Nephritis.*—Convulsions may occur very early in acute nephritis, but in the rarer chronic forms of childhood they are not seen until profound uremia has supervened.

14. *Severe hemorrhage*, with resulting anemia of the brain.

15. *Mineral Poisons, such as Lead.*—The writers have never observed convulsions from this cause in early life, but did view such in an adult patient suffering with a lead encephalopathy at the Philadelphia General Hospital.

16. *Alkaloidal and other Drugs.*—Cases in which children have found and eaten the strychnin pills of some adult are all too common, though the writers have not seen them. We have seen a number of cases of atropin poisoning, but never with convulsions.

17. *Embolism and Thrombosis.*—The former is rare in childhood, and usually occurs in the subjects of cardiac disease. Thrombosis, also rare, may be observed in marantic states, syphilis, or middle-ear disease.

18. *Epilepsy.*

Did time and space permit, it would be interesting to consider the views of Soltman, Elsasser, Kassowitz, James Taylor, etc., concerning the nature of eclamptic seizures in infancy and childhood. Suffice

to say, however, that there is always a morbid underlying state and always an exciting cause of such a convulsion. Our experience does not permit us to speak authoritatively of spasmophilia or the spasmophile diathesis (Thiemich, Finkelstein, etc.). These continental authorities believe that in this diathesis they have found the underlying condition that links laryngismus, tetany and infantile eclampsia.

For practical purposes, when we exclude organic affections of the brain, heart, lung, or kidney, the underlying state in infantile eclampsia is usually rickets, or nervous heredity. The former, though, is a far more frequent and potent cause than the latter.

Treatment.—Prevention here (in the treatment of convulsions) as elsewhere actually involves and arraigns our citizenship. Neither by advice nor legal procedure may we bar the luridly hysteric from marriage; but when those all-too-seldom opportunities arise, we can at least advise against the marriage of the alcoholic, the actively syphilitic, the tuberculous, the epileptic, the imbecile, and the insane.

We may instruct a mother concerning her physical and psychic life during pregnancy, protecting her, whenever possible, from emotional storms and mental shocks as we would from physical injury and infectious disease. We may examine her urine at stated intervals and possibly forefend her from serious renal conditions. Still better, we may study her blood pressure at proper intervals.

The preventive possibilities of good obstetric knowledge and skill must not be forgotten. How many hemiplegic, diplegic, and other defectives might have been saved from convulsions, paralyses, and mental deficiency had instruments in skilled hands been applied soon enough! How many might have been spared even this by the induction of a premature labor or delivery by abdominal section.

Again, a maternity which shall approach in intelligence and effectiveness what Oppenheim has called the "profession of maternity" may play a most effectual part in guarding the infant organism from convulsions and their effects. Even though the original baby fiber represent poor material indeed, by such a mother it may be so closely watched and carefully spun as to yield eventually a durable cloth. A food that shall be clean and shall contain proper percentages of proteids and fat, and best of all is mother's milk; a training that shall early make of the baby a healthy, placid automaton; a hygiene that shall be searching enough to enter into every detail of the infantile existence; a fostering care that shall protect from bodily injury, from nervous strain, and from infectious disease—these are the potent preventive instruments that any good mother may wield. And we say "good" advisedly,

for it is but voicing a latter-day truism to denominate ignorance sin and culpable negligence crime.

Intelligent medical supervision is still more potent, though unfortunately it can only be exercised in the better classes of society. If the baby is hand-fed, it pays the physician to lose a patient, or even a whole family, rather than to fail of his obvious duty and see that baby at least once in a fortnight. At such visits, he may observe evidences of insufficient nourishment, of improper quality of food, of gastric or intestinal derangement, of beginning rickets or scurvy or atrophy, of reflex irritation from various sources, etc.; and so dangers immediate or remote may be averted.

In patients with inherited or acquired convulsive tendencies, every source of reflex irritation that admits of such treatment should be summarily removed. Though this view may not seem in accord with much modern teaching, we would include here the lancing of the gums in properly selected cases.

In short, most convulsions should be viewed as wholly preventable occurrences, for which parents, caretakers, or lack of medical foresight are to blame.

But the harm has been done, and the convulsive seizure is on! What shall the mother do? First of all she should send for medical aid; for as we have seen, there are convulsions and convulsions. Whilst she is awaiting skilled help, however, there are probably few measures to which she may resort that are more efficient than the old-time mustard bath. It is necessary that she should have most explicit directions concerning the temperature of such a bath lest the baby be severely burned.

And what shall the physician do should he arrive while the little patient is still convulsed? Again, despite many statements to the contrary, we know of no therapeutic agent more uniformly dependable than chloroform. To reduce blood pressure and remove the excited ganglionic cells from the reflex arcs would seem *a priori* rational things to achieve, and these results chloroform accomplishes. Pneumonia, the later stages of other infectious diseases, organic disease of the heart, and prostration toward the end of exhausting diseases, furnish contraindications to the use of chloroform.

Whilst the patient is anesthetized, it is good practice to wash out the bowel with warm normal saline solution, permitting several ounces of the fluid to be retained. Quite recently the injection of a second quart of saline solution, given to a seventeen-months-old baby, produced to our astonished gaze 8 inches of sewing silk, 32 inches of

darning cotton, and some hair that the mother recognized as having come originally from the tail of a rocking-horse. If there is high bodily temperature, there are few measures more potent than the use of cool or even cold normal salt solution used in the same way. If the need seems to exist, wash out the stomach too. It is safer than the administration of emetics.

But we have not reached the full length of the gastrointestinal tract; so it is usually best to supplement the measures mentioned with the use of one large dose of calomel or with broken doses of the same drug. It is good practice to follow the calomel with a single dose of castor oil or spiced syrup of rhubarb.

To prevent recurrences, other old-time remedies are of great service, viz., the bromides in good-sized doses and chloral. The latter drug is best given by the rectal route in sufficient starch-water to render it unirritating. We quite agree with some of our English brethren that these two drugs are more efficient in combination than when either one is administered alone. The coal-tar products, too, particularly acetphenetidin, serve us as valuable antispasmodic agents. When convulsions are not controlled by the measures detailed, each seizure being unduly prolonged, or the child tending to pass from one convulsion into another, morphin sulphate (gr. 1/100 or more) and atropine sulphate (gr. 1/600) should be given hypodermatically. They are life-saving agents. With hyoscine, vaunted by our English brethren, we have had no experience.

After the eclamptic storm has passed, absolute rest of body and mind should be secured for several days.

In the future treatment, prophylaxis is still of avail, for above all things we do not wish the "convulsive habit" to form, realizing full well its relationship to epilepsy of later life. Again, we must bear in mind that there is an underlying tendency to be discovered and dealt with, and that reflex irritation, though slight in degree, may operate upon unduly sensitive neurons.

In special cases, either during convulsive attacks or looking toward their prevention, the following measures may prove of value:

Hydrotherapeutic Agents.—We have spoken of enemata and enterocyses (warm, cool, and cold), of lavage and of the mustard bath; it remains to speak of hypodermoclysis and of the external use of cold. In hypodermoclysis we unquestionably possess a life-saving measure. The normal saline solution (in amounts not exceeding 2 or 3 ounces for infants) should be delivered to the tissues at a temperature of 104° or 105° if we would see the full effects in cholera nostras, the hydrocepha-

loid state, and the anuria of scarlatinal nephritis. Dr. Hollopeter suggests the use of a large antitoxin syringe for this purpose, so that one may know the approximate temperature at which the fluid is injected.

With high bodily temperatures, particularly those that are rising rapidly, the cool bath or pack (95°, reduced to 85°, or exceptionally to 80°) is not only antispasmodic in its action, but it may, like the cool enteroclysis, save life. The value of these various hydrotherapeutic measures can scarcely be overestimated. Water is one of the greatest therapeutic agents of modern times, but much depends upon the technic used in its administration.

Stimulants.—In the successful treatment of convulsions there is a large field for the use of atropin, strychnin, alcohol, and camphor. Many a case of severe bronchopneumonia, or indeed of other varieties of pneumonia in rachitic subjects, might have been saved had strychnin and atropin been used to control the convulsions instead of the depressing drugs. In marantic states and in the hydrocephaloid condition stimulants should always be administered with a free hand.

Bloodletting.—In a recent case of Dr. Hamill's, one of streptococcic infection, the removal of two cubic centimeters of blood (for cultural purposes) wrought a most wonderful change in the infant—indeed, he eventually recovered. Might not this measure prove of value in other septic states, particularly if followed by a hypodermoclysis? It also seems worthy of trial in congenital cardiac disease with cyanosis. It should be resorted to in the eclamptic seizures of nephritis.

The Use of Oxygen, Artificial Respiration, and Massage of the Heart.—Were oxygen employed earlier and oftener in the treatment of pneumonia, cyanosis with cardiac disease, etc., it would cease to have a bad name and many lives would be spared. During the convulsions of asphyxia, from one cause or another, artificial respiration may act most wonderfully. This is well known in the treatment of asphyxia at birth; but the useful measure is rarely employed later on, when either a modified Sylvester or the Laborde method may be well employed. Again, it is too seldom recalled that the compressible chest of an infant and its lax abdominal walls permit of massage for a failing heart much as we may handle the exposed heart of a dog—resuscitating it when it "flimmers."

Lumbar Puncture and Puncture of the Lateral Ventricle.—Lumbar puncture should be employed for diagnostic purposes in all cases of meningitis. It should also be used therapeutically whenever there is evidence of increased intracranial pressure. It is thus of value in the convulsions accompanying meningitis and hydrocephalus. Dr.

Willson has also demonstrated its value in the treatment of uremia. Unfortunately, one cannot predict its results with certainty. Thus in a baby seen with Dr. Deichler, which had sustained at birth a fracture of the right temporal bone, with subsequent meningitis and pontine paralysis, the performance of a lumbar puncture and removal of 3 ounces of fluid relieved the baby of convulsions and dysphagia. In the case of Wm. P., already mentioned, the lumbar puncture secured us but 6 centimeters of fluid, whilst the puncture of his lateral ventricle resulted in the draining away of 23 ounces (!). The latter patient never had another convulsion.

The treatment of epilepsy will be dealt with in the succeeding chapter.

EPILEPSY

Synonyms.—Morbus Sacer; Morbus Caducus Sive Sacer; Morbus Divinus; Falling Fits, or Falling Sickness

The disease was known to the ancients. Holy Writ contains several suggestive references. Julius Caesar is said to have had the falling sickness.

Epilepsy is a syndrome or a collection of symptoms rather than a disease. It is one of the hereditary diseases or disorders of the nervous system, in which explosive discharges take place in the motor cortex of the brain. These usually cause convulsions with loss of consciousness (grand mal); sometimes loss of consciousness without convulsions (petit mal); rarely convulsions of a focal character without loss of consciousness (Jacksonian epilepsy); and still more rarely, purely psychic epilepsy.

Etiology.—The causes of epileptic seizures are of infinite variety In the majority of cases epilepsy begins before puberty, and rarely after the twenty-fifth year. Epilepsy may begin in infancy, and may continue throughout life; or it may disappear for months or years after the initial convulsions, only to reappear in later childhood or adolescence. Epilepsy appearing in the fourth or fifth decade of life is usually due to syphilis. Beyond these periods, it is most often dependent upon cardiovascular disease. Heredity plays an important rôle 35 per cent. of Gowers' cases were due to heredity. This does not mean epileptic heredity alone, but includes the so-called transforming neuroses. Indeed, collateral branch inheritance, or epilepsy that skips a generation, is more often found than direct epileptic inheritance Families in whom neuralgia, hysteria, insanity, or any other neurosis

prevails are most liable to fall victims to this malady. Any cause which impairs the general health and exhausts the nervous system acts as a predisposing influence. Chronic alcoholism, syphilitic taints (in parents), parental tuberculosis, trauma occurring in childhood, infectious diseases of childhood. Reflex irritations—intestinal worms, disordered dentition, adherent prepuce, foreign body in nose or ear, and errors in ocular refraction have been claimed by eminent clinicians as exciting causes of convulsions in the predisposed. Autointoxications may also prove of importance in the production of epileptic fits.

Epileptoid disorders are now becoming more carefully differentiated and grouped into such classes as can be shown to have a common cause: for example, hysteria, which imitates so closely many diseases, puerperal convulsions or eclampsia, uremic convulsions and other toxemias, the common convulsive prodromes of the infectious diseases, and certain degenerative processes.

The name epilepsy is given to a large group of convulsive disorders, the causes of which are unknown, though they may be shrewdly suspected by reason of facts which are progressively less easy to interpret. When a local area of the brain cortex is disordered sufficiently to produce irregular discharges, it is called "focal epilepsy." ("Jacksonian epilepsy.") These cases may be explained by a focus of inflammation, a new growth, or an injury to the skull. Such convulsions are better designated epileptiform.

In a smaller group of epilepsies the cause cannot be differentiated, and these are still misdescribed by the term idiopathic. It is generally admitted (certainly this is our conviction) that a predisposition to convulsive states is required for most causes to act upon, and this is especially true for reflex causes. Instability of nervous equilibrium will render one child vulnerable to slight sensory influences, whereas another, similarly or even worse exposed, may escape convulsions.

Morbid Anatomy.—Gross deformities, such as absence of a part of the brain (porencephalia) or areas of changed consistency (sclerosis, softening, or the like), are to be classed under proper heads. (See cerebral hemiplegia; cerebral diplegia; brain tumor, etc.).

True epilepsy is surely a disease of the brain cortex; but often the most minute search fails to reveal anything at autopsy. If the patient dies in the "status epilepticus," we are not surprised at finding minute meningeal and cortical hemorrhages, nor venous and sinus engagements. Certain cases evidence meningo-encephalitis and tuberous sclerosis (see above). Chaslin, Fèrè and others have

found neurogliar proliferation. Von Giesen in two patients operated upon in life, found changes in the pyramidal cells of the cortex and in the neuroglia. Bevan Lewis found nuclear degeneration of the cells of the second layer of the cortex. Bleuler found hypertrophy of the neurogliar bundles between the pia and the outermost nerve bundles. These he did not observe in other brains. Ohlmacher reports persistence of the thymus gland and enlargement of the mesenteric glands in autopsies upon epileptics. (Church and Petersen—Spiller.)

Symptoms.—The one most conspicuous factor in epilepsy is the convulsion, an explosion of nervous discharge from the brain centers. The convulsion is apparently dependent upon cellular instability of the motor centers. Trivial irritation of these centers causes the epileptic fits. This is accompanied by a loss of consciousness and various physical disorders. The more important feature by far is the psychic disturbance.

The most graphic feature of epilepsy is the fit. This is commonly subdivided into two distinct varieties—major attacks, or *grand mal*, and minor attacks, or *petit mal*. It is only too common to find those who suffer from both varieties. While there is, even in the same individual, a sliding scale between these two varieties, yet there are very distinct differences, especially in the line of prognosis, the lesser attacks being much more difficult to control. During the interval there is little or nothing to distinguish the sufferer from a well person. The disorder consists of an ever-present tendency for the victim to suffer from a fit or convulsion, brief or protracted, accompanied by psychoses of the gravest importance. In most cases—and they are the fortunate ones—there is a distinct warning, more or less definite and extensive. Those who possess this are enabled to seek a place of safety before the attack overmasters them; they are also enabled to use remedies which are sometimes successful in warding off the attack. These prodromes are sometimes vague sensations referred to the stomach, or curious sensations, as formication in the extremities. At times they consist of slight twitching movements or mental or emotional states—restlessness, irritability of temper, or excitement. We agree with authorities who distinguish these prodromal symptoms from auræ. The prodromes may last hours or even days; auræ are sensations which immediately precede the paroxysm. The term aura, meaning a breath of air, is correctly applied to the epigastric sensation, the dizziness, the noise, the vision, the olfactory or gastatory sensation, as the "dreamy state" (Hughlings Jackson) that the patient experiences just before

he passes into his convulsion. When the aura is clear and rightly interpreted by the patient, an invaluable opportunity is afforded to seek a place of safety or otherwise prepare for the oncoming period of unconsciousness. The chief symptoms of an attack of major epilepsy are thus arranged by Sachs, in their order of importance and their usual occurrence:

1. Prodromes, generally of a sensory character. At times there is a vasomotor or psychic disturbance.
2. Initial cry.
3. Loss of consciousness (very sudden).
4. Pupils dilated; no reaction.
5. Tonic or clonic spasm of muscles (unilateral, partial, or general).
6. Spasm of respiratory muscles, which may lead to asphyxia.
7. Spasm of the muscles of the jaw (biting of the tongue, bloody foam).
8. Spasm relaxes and movements become clonic and then intermittent.
9. Involuntary passage of urine or of feces.
10 Gradual recovery of consciousness, followed by a prolonged stupor or profound sleep.

Partial or unilateral epilepsy points toward foci of organic mischief. In this form of epilepsy, spoken of as Jacksonian, there is usually undisturbed consciousness. Mills maintains, however, that there is a momentary loss of consciousness. General convulsions rather indicate hereditary or idiopathic forms. The localized convulsions may at any time become general, and then there is practically no ground for differentiation except that the "order of march" of the convulsion, particularly its beginnings, may furnish us with important evidence of local damage or disease to the brain. It is wise to search carefuly into the history of every case for hereditary or parental causes, and into the personal history of possible trauma during birth, and the exact form of attack as indicating possible organic brain trouble. All this will potently influence both prognosis and treatment.

In a certain number of instances the attack is almost altogether motor and occurs during sleep. This is called by Lloyd "somnaic epilepsy," a better term than "nocturnal," as it is during sleep that attack accurs, be this by day or night. We know a young girl who has had but four convulsions, and all have occurred in sleep.

Petit mal may take many forms. The patient may merely become pale and faint. His pupils usually dilate. He may be temporarily interrupted in speech or motor act, may appear confused, and then may proceed with what he was saying or doing.

Masked epilepsy is that variety in which the sensory and motor features are replaced by psychoses, often mere vagaries, but sometimes maniacal outbreaks. These cases are often most obscure and require close study and emphatic warning to parents and caretakers.

By far the most important symptoms of epilepsy are the psychic phenomena. "Epilepsy is much more than a fit: its essential factor is a wide-spread, degenerative process which involves not only the sensory and motor cortex, but also the highest intellectual centers of the brain" (Lloyd).

In certain cases disordered mental states accompany the aura: confusion, fear, or anger arises, which passes into the convulsion or stupor.

Episodes of maniacal fury may replace the ordinary features of the paroxysm, or pass into other forms of mental derangement, as of confusional states, delusions, or moral perversions. Masked epilepsy or moral mania may follow the paroxysm, hence we have in preepileptic and postepileptic states most important and dangerous phenomena.

Many of the large viscera are affected, impairing function and jeopardizing life. Digestion is frequently disordered, especially after the fit, as well as loss of control over sphincters and transient albuminuria. Gastro-intestinal disorders also precipitate the fit, and the removal of these may change both the severity and character of the disease.

When the disorder has begun in early life, various stigmata of degeneration are often seen, such as asymmetries of cranium and face, stunted growth, poor teeth, and low-type ears and genitalia.

Diagnosis.—In epilepsy the aura, suddenness of the attack, and loss of consciousness, accompanied by tonic and clonic spasms, are distinctive features. If these are repeated at more or less regular intervals, the diagnosis is conclusive. Exaggerated deep reflexes in one half of the body indicate a preceding hemiplegia as the cause.

Hysteria simulates epilepsy, but there are obvious points of difference in the history, degree of unconsciousness, etc. Uremia induces fits very like the disorder, but is to be recognized by the history and urinalysis. Organic brain-lesions induce convulsions closely resembling epilepsy. In these cases are also paralyses of motion and sensation, optic neuritis, vomiting, acute mental symptoms, headaches, and special histories.

Reflex eclampsia in children from gastro-intestinal disorders occurs in those who are strongly predisposed to convulsive states or already damaged by nutritive or infectious diseases. Possibly a cure can be effected here before the condition progresses too far.

Prognosis.—A cure is possible in a few favorable cases not dependent on gross brain changes. In chronic cases, from whatever cause, little hope can be held out, although no effort must be spared to strive to control the convulsions, which in their progress work mischief, and it is always possible that a good result may be achieved.

Surgery affords increasing possibilities year by year. We have seen one case get entirely well, although morbid impulses remained. The outlook is, however, far from brilliant.

Treatment.—The treatment of epilepsy should always embrace two considerations: One directed to the prevention of the attack, and the other to the control of nervous discharges or overaction of the cortical cells. As has been shown, grave instability of the nervous cells in an individual renders him extremely susceptible to potent irritants of all sorts, psychic and physical. Every means should be employed to maintain the patient on an even plane, in a wholesome equilibrium. All circumstances calculated to produce gross disturbances should be avoided. Overcrowding, close atmosphere, extreme excitement, digestive disturbances, are in themselves capable of precipitating an attack. A sufferer from epilepsy should live a life of great regularity, provided with suitable amusement, occupation, and education, and be kept as much as possible in the open air. Farm or colony existence best safeguards the interests of the patient and society. The organs of digestion should receive especial and unremitting care. A single indiscretion may bring on a fit. Neglect of bowel evacuation, and, above all, if intestinal putrefaction takes place, may not only induce an attack, but actually be the starting-point of the disease in one so predisposed. The skin should receive adequate attention and cool bathing; sea-baths and sometimes hot or medicated baths and oil inunctions are valuable auxiliary measures. Sleep should be undisturbed and sound. Tranquilizing medicines had better be given increasingly toward night. Above all, there should be secured moral and mental tranquillity and contentment. By such means as these alone the seizures may be markedly lessened in severity and oftentimes in numbers. Many reflex sources of irritaton have been accredited with the power of producing the disease, such as eye-strain, disordered ocular muscle balance, refractive errors, and the like, adenoid growths, laryngeal irritation, adherent prepuces, intestinal parasites. Indeed, the whole train of reflex irritations are more or less efficient as well as instrumental causes, which should always be removed or sedulously controlled.

Of drugs, the bromids have held first place in spite of all rivals. They are not curative, strictly speaking, but through their use some

cases have recovered. At least, the use of bromids, especially if judiciously administered, with proper regulation and safeguards, mitigate most admirably the severity and number of the attacks, not seldom keeping them off successfully, and enabling the patient to be a useful citizen. The action of the bromids is generally held to be chiefly that of motor depressants, checking the overexcitability of the cortical cells. There is evidence to show that they exert another quality by lessening the activity of the toxins circulating in the blood, which at or near a convulsive seizure are distinctly more virulent. Of the form of bromid, the salt of potassium is most widely used, but that of sodium is even better, and of lithium better still. Ammonium bromid may be used. A mixture of several bromids is claimed to be of exceptional value, and it is usually best to use them in combination. Much has been claimed for the bromid of strontium, which exerts far less disturbance on the stomach, skin, and mentality, and is the best for children. The best menstruum for the bromids is an essence or elixir of pepsin. It is also well to give, along with these, both arsenic and iron, not only for their action in overcoming the depreciating effects of the bromids upon the blood, but for their own tonic properties. The doses of the bromids should be adjusted to secure a definite effect, increasing or lessening them as they exert a recognizable influence over the fit. There is also another rule useful to remember, and that is to give the doses increasingly toward night, with the largest dose at bedtime, both because the patient is better for thoroughly sound sleep and also to mitigate the disagreeable effects which the drug may exert throughout the waking hours. Children bear the bromids well. Other drugs are useful for their tranquilizing properties, and are often added with value to the bromids—namely, antipyrin, iodid of potassium, belladonna, especially, and also chloral hydrate, acetanilid, and a host of others. Along with a bromid powdered charcoal in essence of pepsin or pancreatin is useful when accompanied by fermentative dyspepsias. To replace the bromids for a shorter or longer period sulphonal serves a good purpose, and trional also, and occasionally the opiates or codein with great caution. Changes in drugs must frequently be made, and most cases improve surprisingly with every change for a time. Flechsig has emphasized the value of a bromo-opiate combination, using the opiate in the solid form in increasing doses for six weeks; then abruptly replacing this by bromids. Cases of long-standing epilepsy not otherwise relieved are thus sometimes much benefited.

Drugs which have the effect of lessening connective tissue or neurogliar proliferation exert a peculiar influence, among which are the

iodids, various preparations of mercury and arsenic, nitrate of silver, and zinc.

Certain remedies deserve mention in connection with special forms of epilepsy. Inhalations of amyl nitrite, suggested by Weir Mitchell, are of greatest utility where there is an aura, recognizable by the patient in time to make use of it. This is well combined with chloroform, and is especially useful in the status epilepticus.

When the heart is at fault, lacking tone or rhythm, etc., cardiac tonics, such as digitalis, are of value alone or along with other drugs. If the vascular tension is too high, this is relieved by the nitrites. Belladonna is a useful adjuvant too—hyoscin hydrobromate or coniin hydrobromate when a change in the form of motor depression is needed. Almost any new plan of treatment may be followed by improvement for a time. The best results are had from healthy, tranquil outdoor life, with limited dietary and rigid attention to the emunctories.

SYDENHAM'S CHOREA

Synonyms.—CHOREA MINOR; ST. VITUS' DANCE; CHOREA SANCTI VITI; MILD CHOREA; RHEUMATIC CHOREA; ACUTE CHOREA

History.—During the fourteenth, fifteenth and sixteenth centuries, epidemics of dancing mania (really a hysterical affection) cropped out in Germany and in the Netherlands. One of the earliest was noted at Aix-la-Chapelle. During an epidemic at Strasburg in 1418, the Prefect of the city ordered the sufferers to repair to the Chapel of St. Vitus at Zabern. Affected subjects from other localities went to different shrines (St. Anthony's, St. John's, etc.). The disease thus became known as chorea (meaning dancing) Sancti Viti. True chorea was described by the great Sydenham in 1686. Unfortunately he conferred the same name upon it.

Definition.—Sydenham's chorea, though ordinarily classed as a neurosis, may be regarded as a nervous disease of infectious origin. It is characterized by automatic, incoordinate movements of an excursive character; by muscular paresis, and more or less marked emotional instability.

Etiology.—One of the first striking points about chorea is its sex relationship. The disease is much more common in girls, different statistics furnishing ratios of from more than 2 to 1 (Holt) to 3 to 1 (James Taylor). Girls are also more subject to relapses than boys. Several English authorities have shown that most of the boys are

affected between the ages of five and ten years; most of the girls between ten and fifteen years. Beyond fifteen, the sex disparity is even greater.

Age.—Chorea is rare before the age of five years. Recently, however, we have seen a severe case in a three year old boy. According to most authorities, the disease is most common between the ages of ten and fifteen years. Beyond the age of twenty, true chorea is practically confined to pregnant women; and these have often had the disease in earlier years.

Season.—Morris Lewis first called attention to an important seasonal relationship, and most authorities have agreed with him. In Philadelphia and New York, the chorea curve attains its highest points in March and May, and falls to its lowest in November. In London, July and August are the months of greatest incidence.

Race.—In England and America, the disease is exceedingly common among the Russian Jews. It is decidedly rare in the full-blooded Negro, and practically unknown in the American Indian. Half-breeds of either race may exhibit it however.

Temperament.—Chorea usually occurs in high-strung neurotic subjects. Its victims, too, are often precocious. While speaking of this temperamental etiologic influence it is well to recall that the disease is more common in the more neurotic of the sexes, and at the most emotional ages (prepubertal and pubertal).

Psychic Influences.—Fright appears to be a causative factor of importance. In one of our cases, however, where punishment meted out by a teacher was the alleged cause, the child promptly developed endocarditis. That fright may act as an exciting cause, in a susceptible subject, most authorities admit. Over-study at school seems to be another psychic factor of considerable importance, particularly in exciting relapses in choreic girls. Immitation chorea is probably hysterical in origin and is very different from the disease under consideration.

Reflex Factors.—Some have contended that refractive errors may produce chorea; but so great an authority as DeSchweinitz practically denies this. Enlarged tonsils and adenoids are certainly important from the etiologic aspect; but we believe they are so because they represent portals of entry for infections. In one of our Polyclinic patients, a girl whose chorea had persisted for two years, removal of the hypertrophied tonsils and adenoids by Dr. Francis Packard promptly effected a cure. Occasionally, intestinal parasites have seemed to be responsible for choreic movements in the predisposed.

Traumatism.—In some patients physical injuries appear to play an

exciting rôle, much as psychic shock may do. One of our patients was stealing a ride on the rear of a trolley car, when the irate conductor struck him over the right parietal region with a wooden sign board. The boy was knocked unconscious momentarily, and subsequently developed left hemichorea. He has had two relapses since the injury. Yet this lad had had repeated attacks of "growing pains," and his family history revealed rheumatism on both sides of the house. He also had a chronic purulent rhinitis and enlarged tonsils.

Rheumatism and Other Infections.—The earliest writers upon chorea were struck by a relationship between arthritis and the former disease, and Tyson states that this association was dwelt upon as early as 1802. But the first conclusive evidence of the rheumatic nature of Sydenham's chorea was furnished by G. See in 1850 (Taylor). Modern statistics culled from different sources appear to present widely different percentages anent of this rheumatic relationship. Holt. calls attention to the fact that percentages of neurologic investigators are almost invariably smaller than those of pediatricians. Spiller, however, who reviewed Tyson's section upon nervous diseases, and James Taylor both do full credit to the importance of the etiologic rôle of rheumatism. What are the reasons for these seeming statistical disparities? The first explanation is furnished by the different conceptions concerning the nature of rheumatism. In adults, true rheumatism probably always takes one form, that of a polyarthritis. In children, however, the manifestations of rheumatism may appear in diverse shapes: Polyarthritis, accompanied by fever, does sometimes occur in the child; but such frank manifestations of the disease are relatively rare in early life, and even when the affection takes this form, redness and swelling of the affected joints are much less in evidence than they are in adult rheumatism. On the other hand, some cases of tonsillitis, cases of growing pains, cases of slight monarticular pains, most cases of endocarditis and pericarditis, some cases of chorea, many cases of urticaria, erythema nodosum and subcutaneous nodules, all form recognized members of the rheumatic series in childhood. Possibly some pleurisies may also be included in this group. The English investigators of this subject (Cheadle, Batten, Poynton and Holmes, Payne, "The Collective Investigation Commission of the British Medical Association," etc.) have done much to place this mooted subject beyond the realm of reasonable question; and Holt, Crandall and Dunn have rendered similar service in this country. Again, as these investigators have all shown, chorea may be the first manifestation of rheumatism, promptly to be followed

by other representatives of the rheumatic series; and in such cas the neurologic investigator naturally fails to secure a history of pr existing rheumatism.

Still's statistics in England, 54.3 per cent. (66.8 per cent., if ca with systolic bruits are included) are singularly similar to Crand and Holt's in this country (56.7 per cent.). The "Collective Inves gation Commission" found:

A history of preceding rheumatism	26.00 per cent.
Rheumatism accompanying or following chorea	32.00 per cent.
Vague rheumatic pains	14.00 per cent.

If family histories of rheumatism are included in the last quo statistics, then the percentage relationship of the two affections becon much higher.

In view of these investigations, can there be any reasonable do that the chorea of childhood is usually a rheumatic manifestat ("rheumatic equivalent")? Still, whose clinical interpretations as astute as his pathologic knowledge is broad, says that it is just reasonable to doubt the rheumatic nature of chorea because arthr is absent, as to deny the existence of tuberculous meningitis in absence of pulmonary tuberculosis.

But admitting the potency of the rheumatic poison (or poison as a judicial review of the evidence must oblige one to do, one is surprised to find that other infectious causes may also be responsi for chorea. We would lay stress upon the fact, however, that rh matism is responsible for more cases of St. Vitus' dance than all ot causes combined. The disease may follow scarlet fever, typh fever, measles, pertussis, tonsillitis (not known to be connected w rheumatism), and a number of other infectious diseases of childho At the present time, we have under our care, a young girl who develo chorea while suffering from an attack of cystitis due to the co bacillus. It is not to be wondered at that the disease should son times complicate or follow scarlet fever more frequently than ot infectious diseases; for many of the arthritides occurring in that dise yield promptly to rheumatic medication.

Pianese has found both a bacillus and a coccus in chorea. Wl injected into dogs and rabbits, the bacillus induced twitchings, c vulsions and death. Poynton and Payne recovered from rheum subjects the same diplococcus that others had found. This, wl inoculated into rabbits, produced polyarthritis, endocarditis a choreic movements. Chemical poisons, such as iodoform, have a

seemed responsible for choreic movements. In at least one case, the chorea disappeared when the drug was discontinued, only to break out again with the resumption of its external use.

Pathology.—Though much work has been done in this field, we really possess little pathologic knowledge. The quasivolitional character of choreic movements, the occurrence of hemichorea, the emotional accompaniments of the disease, and the occasional occurrence of chorea insaniens, all stamp the affection as a disease of the cerebral cortex. Indeed, "Poynton and Holmes found vascular engorgement of the pia mater and underlying cortex, with some round-cell infiltration of the piaarachnoid in the neighborhood of the vessels, and here and there thromboses of small vessels, both in the pia and cortex" (Still).

Painstaking work has been done in this field by Dana, Dickinson, Osler, Bevan Lewis, See, Soltmann, Müller, Broadbent, Meyers, Meynert and Nauwerk. The changes found in some cases, may be briefly summarized as follows: Intense cerebral hyperemia, periarterial exudation, erosions, softened spots, minute hemorrhages and occasional emboli. These pathologic changes have usually been most marked in the deeper parts of the motor tract, in the lenticular nucleus and the thalamus. Bevan Lewis found apoplexy in two cases—cerebellar in one, in the other cerebral and extraventricular. The so-called "chorea corpuscles" are in no wise characteristic, having been found in other conditions. The chorea of dogs is a very different disease from human chorea.

But though there may be some lack of knowledge concerning the exact nature of the changes in the central nervous system, the same cannot be said of the cardiopathology of chorea. Osler states that acute articular rheumatism itself does not wreak damage upon the heart so often as do the fatal cases of chorea. In a review of fatal cases, the latter authority found the heart affected sixty-six times in seventy-three cases (endocarditis, 85 per cent.; pericarditis, 26 per cent.; combined lesions, 90.4 per cent.). Sturges found seventy-five instances of cardiac involvement in eighty autopsies (93.8 per cent.). Gowers states that the heart is found affected in 90 per cent. of the fatal cases. Ulcerative endocarditis is rare in chorea, and as several of the German authorities have pointed out, the granulations on the mitral valve may be so delicate as almost to escape the naked eye.

Pneumonia (12 per cent. in Osler's statistics), acute pleuritis, pyemia and phlebitis, are other pathologic conditions that have been revealed at autopsy in the victims of chorea.

Symptomatology and Clinical Course.—The disease is rather rarely preceded by distinct prodromes, though the subjects may be neurotic, anemic or rheumatic before the onset of the chorea. The three-year old boy, whose case we have mentioned had fever and rheumatic pains for ten days before the afebrile chorea started. He was thought to have tuberculous meningitis. The onset of the affection may be sudden, though it is usually gradual. For several days, the patient exhibits emotional instability, possibly marked perversity, and shows an awkwardness in voluntary movements (dropping things, failing to button or hook clothes properly, or stumbling). Such children may be punished. Headache may be present at this time. After several days, the incoordinate and involuntary movements become so marked that the mother, nurse or teacher suspects something is amiss. Such movements probably begin first in the tongue, and probably continue longest in this locality. The movements that are first noted, however, are those of the fingers and hands. The fingers are extended and flexed suddenly, or are spread widely apart and as suddenly adducted. Pronation and supination, occurring suddenly and in the same incoordinate manner, are more commonly observed than movements of the wrist. So shoulder movements are more common than elbow movements, and may be shrugging in character, or the whole arm may suddenly be thrown behind the trunk. Facial movements are also common—grimacing, winking of the eyes, furrowing of the brow, drawing down the corners of the mouth, or drawing the mouth to one side. If the patient is asked to protude the tongue, it is noted that the organ is very tremulous. It is also protruded to one side or another; is then held between the teeth to keep it still; and is finally withdrawn with a sharp "cluck" The expression is often peculiarly sad; but the child may exhibit so much chagrin that his expression is almost imbecilic.

The legs are also affected; though usually to a less degree. When sitting, the movements are usually those of extension and flexion at the knee, and the patient may endeavor to control them by placing one foot over the other. In walking, such movements tend to interfere with orderly progression, the patient usually stumbling, and in severe cases walking may be impossible. The trunk and neck muscles are usually affected, though again in less degree. The diaphragm may be involved, and, as a result, respiration becomes jerky and irregular. In some cases, the act of swallowing may be so difficult that it becomes necessary to feed the patient through a tube. Speech is affected in most instances; though in some very slightly. There may be only slight dysarthria, with jerky explosive expression; or in bad cases, the

patient may be totally unable to articulate. The trouble is with articulation and not with phonation.

All of the movements are of a sudden, excursive and quasivolitional character; but usually they are not under the control of the will, and are rendered worse by attempts at voluntary control. Observation, too, usually accentuates them. James Taylor summarizes the existing phenomena as follows: 1. Involuntary spontaneous movements; 2. weakness of voluntary movements; 3. loss of precision in voluntary movements; 4. emotional instability, and other psychic phenomena.

The movements may be confined to one-half of the body, ("hemi-chorea"), or they may originate in one side, and later spread to the other. M. Allen Starr states that hemi-chorea is present in one-third of all cases; but usually we find that one side is more involved than the other. The individual movements are not repeated, but appear now here, now there, in rapid and bewildering succession. They are much more rapid than athetoid movements; but on the other hand, they are slower than the movements of paramyoclonus or electric chorea. In rare cases, they may be so severe that the patient is injured by being thrown from one side of the bed to the other. The movements disappear in sleep.

Weakness in voluntary action varies greatly in different cases. In some it is scarcely perceptible, while in others it is so marked that even the choreic movements cease, and we have the rare condition of paralytic chorea (chorea mollis). In the latter cases, however, the movements of the tongue may enable us to make a diagnosis (Sachs).

The deep reflexes are undisturbed in about one-half the patients. In the others, they may be either increased or diminished (Tyson). Bonhöffer claims that muscle tonus is always diminished. If the patient is lifted by the shoulders, they pass upward almost to the level of the ears (Thiemich).

Sensory symptoms in chorea are not usually present. We have mentioned headache, as an early symptom, and think with Still that it may be due to meningeal and cerebral hyperemia. Some cases have severe pains in the legs or other affected parts. (Painful chorea of Weir Mitchell.) The pain may be accompanied by objective tenderness of joints or nerve trunks. In our estimation, such pains are probably rheumatic. We have seen them disappear under treatment with salicylates. Anesthesias are more rare than these painful subjective phenomena.

Psychic symptoms are usually present in the emotional form that we have mentioned. The child is self-conscious, flushes and pales on

slight provocation, is peevish, capricious, and sensitive to teasing or reprimand. Ability to concentrate the attention is also diminished to a noticeable degree. In some cases, usually severe and markedly septic ones, the patient becomes maniacal (chorea insaniens). Sleep becomes more and more difficult to obtain, even with powerful sedatives, and finally the patient tends to sink into a comatose condition. This is usually a fatal disease; but should the patient recover, the full mentality is usually restored. In some maniacal cases, where movements have been overshadowed clinically by the mental symptoms, the patients have been sent to asylums.

The course of chorea is usually afebrile, unless cardiac involvements or joint affections cause a moderate rise in temperature. Such a rise should always lead to a most careful study of the circulation. In chorea insaniens, the temperature may reach 104° or higher.

The pulse rate is ordinarily more rapid than in health. This is not surprising when the number and violence of the movements are considered. The pulse may be irregular, but this is probably not due to "chorea of the heart muscle" but rather to the irregularity of respiration.

Murmurs and other evidences of cardiac disease are common in chorea. Still found bruits in 155 out of 250 cases. Thirty of these disappeared while under observation. Thirty-eight patients had diastolic as well as systolic bruits, and three had aortic as well as apical murmurs. Five patients had pericarditis; two of them pericarditis without murmurs. Osler gives splendid rules for the guidance of the general practitioner in distinguishing functional from organic murmurs. But when one thinks of the frequency of autopsal cardiac lesions, and when one recalls how slight such vegetations may be; it seems safest to regard every murmur in a choreic case as probably organic until it is proved otherwise. We agree with Holt that the majority of them are probably organic.

The choreic patient is often anemic. She is liable to have a poor appetite, and in consequence may lose much flesh. Still it is remarkable, how little the nutrition of some patients suffers.

The average course of chorea is from eight to ten weeks. Occasionally rheumatic patients, who are put to bed, and given salicylates respond in a much shorter time; but such results are not to be predicted. Cases of chronic chorea extending over many months, or even two years or more. are seen now and then. They should be carefully studied to exclude organic nervous disease, such as brain tumor, etc. In one such case, as mentioned, we believed that repeated infections occurred

through her diseased tonsils. Chorea tends to relapse, usually in the spring of the year, and, as stated, such relapses are much more common in girls than in boys. It is rare for a boy to have more than three attacks. The relapsing tendency is liable to cease with the occurrence of puberty.

Diagnosis.—In most cases, this is made with such readiness that it is not unusual to have a correct surmise reached by an interested school teacher. The incoordinate character of the movements, their sudden occurrence; their amplitude of excursion; their tendency not to repeat but to occur successively in different parts of the body, together with the disturbed emotional side of the child, all go to make up a rather unmistakable symptom-complex and yet, in certain cases, mistakes are made, even by experts. Probably it is most often confused with habit chorea, or habit tics. The greatest distinguishing feature here, is that the habit tic tends to exhibit itself in the same way over and over again. The movements occur at regular intervals, and if they are controlled by the patient, they proceed to occur in more rapid succession, as if to make up for lost time (Patrick).

Posthemiplegic or diplegic chorea if carefully investigated will be found to be associated with some spasticity, with increased reflexes, and possibly with more or less mental deficiency.

We have already stated that choreic movements are more rapid than the tentacle-like movements of athetosis, and less rapid than the sudden movements of electric chorea. The patients exhibiting the latter movements also evidence some hysteric phenomena. Imitation chorea, really a hysterical affection, is usually amenable to suggestion. On one occasion H. C. Wood anesthetized a little subject affected with imitation chorea before several other children evidencing like movements. The result was an immediate stamping out of the disease. Friedreich's ataxia has its absent knee-jerks, its deformities of feet and spine, its nystagmus and its hereditary history to distinguish it from Sydenham's chorea.

Prognosis.—According to the Collective Investigation Commission but 2 per cent. of choreic patients succumb to the disease. Some of these deaths are due to exhaustion; but most of them result from sepsis and cardiac lesions play important parts in the production of the fatal issue. Chorea insaniens is usually a fatal disease.

Intelligent prognostication, however, must take into consideration far more than the immediate menace of the disease: The tendency of chorea to recur, particularly in the spring, should always be mentioned to parents. Again, it should be stated that chorea is usually a

rheumatic equivalent: that it may represent the first evidence of rheumatism, and that the child may subsequently develop joint, cutaneous or serious cardiac lesions.

In the presence of cardiac murmurs, even without cardiac enlargement, one's prognosis should always be guarded. Time furnishes the best test of the organic or inorganic nature of the bruit.

Treatment.—Naturally, this divides itself into the treatment of the attack, and the prevention of subsequent attacks.

The Attack.—If we grant that chorea is an infectious disease, that the materies morbi is usually that of rheumatism, and that the endocardium, pericardium or both suffer in many cases, it seems but rational that the patient suffering with Sydenham's chorea should be put to bed. We make no exceptions in the presence of mild cases, and see why none should be made. Rest seems rational on the face of it, and practically we find the course of the disease shortened, severe cases transformed into milder ones, less emotional strain, nutrition better maintained, and fewer cardiac involvements. To permit these oversensitive patients to be exposed to the thoughtless gibes of their comrades is as unwise from the emotional standpoint as unrestricted activity is from the physical side. Rest need not be absolute, the little patient being permitted play with toys that do not require too much coordination in their manipulation; but it should be rest in bed. Few persons should have access to the patient's apartment though it is not necessary to screen them off from light and observation. We reach a stage, when the choreic movements have declined in number and intensity, when the patient may be permitted to get out of bed for a longer time each day, the effects of this relaxed treatment being carefully noted. But should there be a cardiac murmur or other evidence of endocardial or pericardial involvement, the patient should remain at rest until we are assured that the cardiac lesion is a permanent one. This may involve months of rest; but on the other hand, it gives the patient a chance to go through life with an undamaged heart.

It is to be recalled that choreic movements cease during sleep. It is therefore our custom to endeavor to secure one or two naps a day through the administration of one of the so-called functional hypnotics. Chloralamid, sulphonal, trional or chloretone are the remedies usually employed for this purpose. It is our custom to administer a small dose (3 to 5 grains) three times a day. In the presence of chorea insaniens, it may be necessary to employ hyoscine hydrobromate

(gr. 1/150–1/80); chloral hydrate (gr. x–xv); or morphin sulphate in order to secure sleep.

Concerning the value of other remedies in this disease, there is much dispute. Our experience has impressed us much in favor of the salicylates, though we have not used them in the massive doses employed by Dr. Lees. As a rule, we give from five to ten grains of strontium salicylate every three hours. If larger doses are employed alkalies should be administered conjointly (Lees). In one case of severe chorea, approaching the chorea insaniens, the patient had been severely bruised by repeatedly striking the sides of a large "four-posted" bed. She was seen by one of us with Dr. Smith of Haddonfield. One week later, under the use of salicylates, the movements had so diminished that her case might well have been styled a mild one. Her mental symptoms had also cleared to an astonishing degree.

Concerning the value of arsenic, there is no doubt; but concerning the mode of its administration there is considerable difference of opinion. We chance to have seen two cases of arsenical neuritis, and have possibly become prejudiced against the use of large doses, often advocated, of Fowler's solution, or other arsenical preparations. James Taylor states that he has seen no better results from large doses of arsenic than from smaller ones. Theoretically arsenic can do good in only one way: by bettering nutrition, particularly the nutrition of nerve centers. It is our custom to give arsenic, in conjunction with iron, in the form of the compound sumbul pill. The dosage being modified to suit the age. Strychnin we have never employed in chorea.

Cimicifuga, originally proposed by Young in 1831, is said by H. C. Wood to be of undoubted value in the treatment of chorea. Isaac Corson (Tyson) also employed it with uniform results. It is interesting to note that this drug was formerly much esteemed in the treatment of rheumatism.

The diet of the choreic patient should be plentiful and nutritious. She is expending much energy and needs a plentiful supply in her food. Milk, eggs, green vegetables, and meat (once a day) are our principal dependences. Sweets, and other carbohydrates are reduced to a minimum, and stimulants and high seasoning are forbidden. Should appetite wane, as it often does, it is usually bettered by careful attention to the bowels, tonics, hydrotherapy and massage.

If constipation obtains, it is our custom to give some mild vegetable laxative at bedtime, and some saline aperient in the morning.

Hydrotherapy plays an important part in the treatment of chorea.

We find that the best sedative results are obtained by the warm bath or the hot pack. We are unalterably opposed to the custom of cold bathing or cold douching of the spine. There is danger from the rheumatic standpoint, the blood pressure is raised, and the patient is often excited to a harmful degree by the external use of cold water.

Massage too is useful, but its effects must be watched. If the patient is soothed and rendered drowsy by the treatment, well and good. But if she is excited by the massage, it is best to defer the treatment until the choreic movements are on the decline.

Gymnastics of any kind we condemn during the active stage of chorea. With the beginning of convalescence, mild exercsies involving muscular coordination seem to be of service. Such movements are well performed in the warm bath, the water supporting the extremities and furnishing an increased resistance against which muscles must operate. For this useful suggestion, we are indebted to Dr. Spiller.

Preventive Treatment.—Everything should be done to better the nutrition of the choreic patient. She should live an out-of-door life, and should be carefully inured to all kinds of weather. Cold water is now of considerable value, and beginning its use in the warmer months, she should persist in it during the fall and winter. She may be able to wear light underwear, of the mesh variety; but on the other hand, it may be necessary to clothe her in wool. This matter should be studied in the individual patient. It cannot be answered offhand. If she has enlarged tonsils and adenoids, these should be removed. During the spring months of the year, her schooling should be carefully watched and with the least suggestion of mental overstrain or choreic movement, she should be taken from school. We have been impressed with the possible preventive value of occasional short courses of treatment with salicylates in those patients who tend to relapse.

Habit Movements, Habit Chorea, or Tic

Among the conspicuous and not rare disturbances of motion are to be mentioned the habit movements, habit spasms, or convulsive tics strongly resembling chorea, but with special features of their own, and marked differences as to nature, causation, and curability.

These are tricks of movements, coordination of muscular acts, generally involving the face, shoulders, and sometimes legs, simulating purposive acts, accompanied occasionally by speech or vocal and other sounds. In the majority of cases they began as imitations or repetitions of acts, becoming fixed and exaggerated into habits, which are diffi-

cult to cure in proportion as they are matured, and often persist throughout life.

In its origin, habit tic is comparable to the convulsion of reflex cause, *i.e.*, it is excited by some reflex factor that operates upon an unduly sensitive nervous system. Granted the latter, the little trick of habit soon becomes transformed into the typical tic. The habit chorea may remain confined to the neuro-muscular mechanism originally involved, or other mechanisms may be involved through irradiation. This fact is rendered more intelligible when we perceive that most of the acts are such as may be involved in speech and gesticulation.[1] A rough collar or an ill-fitting coat may give rise to the initial movements. Imitation possibly from a patient with Sydenham's chorea may account for their origin.

Nasal conditions (adenoids, polypi, hypertrophied turbinates, spurs, etc.) are often reflexly responsible for the initiation of these tics. Next in order must be mentioned various refractive errors and disturbances of ocular muscular balance. Cheadle, of London, thinks many of the tics arise at the period of the second dentition. Recent observations have led us to confirm this view. Children affected with these habit spasms are often too the subjects of neurotic inheritance. Indeed, in not a few of our own cases, parents or grandparents have had tic.

It is well to use a systematic nomenclature in dealing with this class of allied affections, which Osler says pass insensibly into one another "from a simple, habitual, conscious spasm of the facial muscles to complete coordinate movements with marked physical features, or to habit phenomena purely psychic." The distinguishing factor in the entire group is the habit of repetition, whether of motion or idea, which, while influenced or controlled to some extent by the will, occurs in response to a sort of impulsion in the case of muscular movements, and in the case of imperative ideas as a sort of obsession.

1. Habit spasms, or simple tics, are the common instances of spasmodic movements, chiefly of the face muscles and moderately under volitional control. The acts are repeated more positively and with far greater rapidity than those of chorea; they are more systematic, purposive, and limited in scope. There are cases of sudden contraction of certain muscles very like that produced by an electric shock; hence Henoch has called this electric chorea.

2. Convulsive tic, or Gilles de la Tourette's disease, exhibits, in addition to the ordinary motor disturbances of habit spasm, imperative

[1] It is made still more clear when we recall that the posterior longitudinal bundle connects the nuclei of origin of the 3rd, 4th, 5th, 6th, 7th and 12th cranial nerves.

ideas and explosive, jerky shouts and ejaculations. Some of the wo thus unintentionally uttered or flung out of the mouth are accide reflections of what has been casually heard and yet received a degre subconscious attention, either with a partly formed intention to again, or as probably a full intention never to utter: as, for insta obscene phrases, of which the patient may be unconscious or thro the use of which he becomes intensely mortified.

3. Complex Coordinated Tics (Noir from "Bourneville's Clini —There are tricks of this kind mentioned by many, several of t being strung together in a series: as, a child when offered an ob always blows upon it, smells it, and turns half away, or stooping dc lying on the floor, raising the hands above the head, etc.

4. Psychic tic, or imperative ideas, the outgrowth from imper movements, the fixed idea impelling a child to do certain things u similar circumstances, as the old trick of stepping on different pa stones without touching the cracks, always to go out of the way in] ing certain objects, to cross the street at a certain place each tin passing, etc. So strong are these as to make the life of the suffe burden by the multiplicity of the meaningless procedures. reader who knows his "Boswell" will recall that Samuel Johnson so afflicted.

The **treatment** of these disorders is largely educative. Sedu search should be made for the reflex exciting cause in the nose, teeth, pharynx, etc. After the reflex factor (or factors) has been f and removed, every effort should be made to educate the affected n muscular apparatus to proper coordinated action. Hopeful su tions may prove of much aid in this educative process. Oftentime gienic measures are required, and many of the rational means out under the treatment of chorea will prove of value. A plan tha have followed with much success is to begin by putting the patie bed. The rest does good in itself, and acts as an aid to helpful gestion. Another helpful plan serves to make the abnormal move result in trouble as in a task or in actual discomfort to the pa Thus one child, who started with movements of the alae nasé "sniffling" sounds was made to go get three atomizers and to hav nose sprayed with all three whenever the tic was observed. mother was a sufferer from marked tic.

Automatic Rhythmic Movements

In this term are broadly included head nodding, or movemen assent; head shaking, or negation movements (synonymous

spasmus nutans and nictitatio spatia); gyrospasm; head banging; eclampsia nutans, or salaam convulsions; and eclampsia rotans.

Head nodding and head shaking are manifestations which appear in the infant at any time between the ages of two and eighteen months. They are sometimes preceded by injury to the head, as might be occasioned by a slight fall. But the condition has appeared so many times when such history cannot be elicited that it would lead one to think an injury is not an essential factor in the etiology. In most cases the nodding and shaking are preceded a week or ten days by nystagmus, which may be vertical or horizontal, or vertical in one eye and horizontal in the other. At times there is only a uniocular nystagmus. When the nodding and shaking appear, they are usually limited to a few attacks a day, which tend to increase in number. There sometimes appear cases in which there is almost constant nutans of a mild type, with strong exacerbations. In the great majority of cases the movements seem to be accentuated when the attention is distracted, or if the child makes an effort to hold his head still. Caille reports cases where movements ceased when attention was fixed and also if eyes were bandaged. His treatment of the case was to keep the eyes bandaged for some weeks—only removing the dressing to flush out the conjunctiva. Recovery ensued. The pupils are usually dilated, the eyegrounds normal. The few cases in which fundus changes have been found are coincidental. Occasionally there occur periods of unconsciousness, with marked deviation of eyes to right or left (Hadden).

Very frequently there is a history of rickets, and the rosary and other features are well marked. In all of our cases evidences of rickets have been present. In most of Hadden's cases there occurred, as early symptoms, the throwing back of the head and looking at objects with partially closed eyes.

Head nodding is much rarer than head shaking. Occasionally these alternate in the same patient.

If it be desirable at this time, with our limited knowledge of the condition, to classify them under any particular heading, hysteria in childhood would seem to present the greatest claim, for in hysteria there are frequently salaam movements, pure and simple. Until more is known of the essential nature of those conditions and their relation to the few different lesions which have been found in the brain at death, it will be an impossibility for us to go further than to offer surmises as regards a classification. They are so frequently associated with defective mental development that the suspicion of their being significant of some deep-seated developmental error is urgent.

When a combination of motor impulses by their cross-action imparts a rotary motion to the head, this is known as gyrospasm (Peterson). These spasmodic conditions sometimes increase during sleep. According to Peterson, the number of excursions of the head in these affections rarely exceeds two or three a second. The child may only have an attack during the night, or it may be so persistent that it suddenly awakens him every time he composes himself for sleep.

The following is a case of gyrospasm of our own hitherto unreported B. S., aged six months, female, Russian Hebrew, of excellent family history—mother a large, vigorous woman with abundant breast milk—was brought to Polyclinic Dispensary for relief of gyrospasm. One older child, perfectly strong, was also breast fed. This infant was regarded as exceptionally vigorous, had never been ill, held up its head at three months, and had no convulsions. Automatic movement began ten days ago without ascertainable cause. The first movement was forward and back nodding, alternating with a slight rotary action noticed from time to time during the morning only. On the second day movement was more marked and constant, the series consisting of two or three nods, followed by fifteen or twenty rapid rotations then a quiet interval. In all there were perhaps twenty paroxysms during the day; these are now continuous, and do not altogether cease during sleep.

On examination the infant seems perfectly normal in other respects, is cheerful and intelligent, of good color, and well nourished. On endeavor to make the child fix its eyes or converge them the movements cease for a few seconds, and are replaced by lateral nystagmus, but soon the gyrospasm recurs with increased force. Lowering the eyes, the head leaning forward, also brings relief. The case recovered entirely in a short time.

In eclampsia nutans and rotans there is a bowing, or salaam movement of the neck. Hadden differentiates those conditions from head nodding and head banging, and calls eclampsia nutans and rotans a variety of epilepsy ?.

In anomalous or aberrant forms of epilepsy there is a salaam but also there are other signs of epilepsy.

A perfectly analogous condition to all the above automatic impulsive movements may be induced by suggestion under hypnotism.

Other motor neuroses—such as habit chorea, habit spasm, convulsive tics, echolalia, coprolalia—are dealt with elsewhere.

Treatment.—The treatment of head movements is change of air and climate, and nutritious food and out-of-door life, as much

possible; in short, improved hygiene, careful search being made for and correction of any source of reflex irritation, such as postnasal adenoids, adherent prepuce, phimosis, dentitional disturbances, intestinal disorders, intestinal parasites, etc.

Most of the sufferers are too young to warrant the correction of errors of refraction, though they may readily exert an influence. The condition of any of the aforesaid irritations may solve the difficulty. It is safe, nevertheless, to begin at once on a treatment by sedatives—bromides, valerian, chloral, etc.—nutritive tonics, such as cod-liver oil, iron, phosphorus; fatty and albuminous foods, and the organic nucleo-albumins are likewise indicated. H. C. Wood likens these conditions to those of chorea, which is due, in his opinion, to depression of the inhibitory centers governing the anterior cornual cells of the cord. He accordingly recommends quinin as an inhibitory stimulant.

TETANY

Tetany is a motor neurosis called by some authorities a disease, but is more generally described as a mere disorder based upon several pathologic factors which are more or less constant. It is probably of toxic origin, and bears close etiologic relationship to rickets, being based upon similar causative factors and sharing some of the symptom phases of that disease. It is far from common, yet cannot be considered rare, and is much more frequently recognized of late years, since its entity is better known and clearly described. Tetany is manifested by characteristic attitudes of the hands and certain intermittent tonic cramps of the muscles of the arms and legs, by an excessive electric irritability, and by periods of latency during which the cramps can be artificially induced.

Etiology.—Tetany arises in certain localities, and is not seen again for long periods. It may become epidemic (Bruns). The condition was described by Trousseau originally, who discovered the important symptom known by his name—viz., that an attack could be induced in an affected subject by compressing the arteries and the nerve trunks. Tetany occurs in both adults and children (B. Sachs), but most cases are seen in the very young. Holt says it is usually seen in early infancy. Barthez and Sanné found it more often in children and most in infants. Griffith found 66 per cent. under two years of age.

The disorder is much more common among the children of the lower classes, and whose surroundings are unwholesome. It almost

always follows upon depressing conditions, overexertion, or rec
nizable disorders or diseases, especially the transmissible on
hence its pathology is regarded as a toxemia of probably a comp
sort, or perhaps a mere neurosis. It is frequently associated v
rickets. Rarely it has resulted from a known poison, such as le
alcohol, or ergot. It was formerly thought to result from extir
tion of the thyroid gland. It is now known that extirpation
the thyroid gland does not produce tetany, when care is taken no
injure or remove the parathyroid glands. Escherich and others h
found hemorrhage in the parathyroid glands in tetany; but th
finds are by no means constant, and hemorrhages have been fo
when no tetany had been present. Recently, MacCallum
Voegthir have found calcium diminished in the blood and ner
tissues, and experimental tetany has been relieved by the injectio
calcium. We seem on the way to a solution of the tetany prob
That intestinal parasites secrete a peculiarly disturbing toxin is u
by Albu and others.

In conclusion, it may be said that the causes of tetany in childh
are not wholly clear. It never affects healthy children. Rachitis
important predisposing influence. The remote cause of the attac
some gastro-intestinal disturbance, proved by the frequent associa
of tetany and acute dyspepsia, and the effect of treatment directe
such conditions (Hauser). But the actual exciting cause is a dist
ance of calcium metabolism. The withdrawal of calcium salts f
nervous tissues leaves them in a hyperexcitable state.

Pathologic Anatomy.—No constant nor characteristic le
has been found present at autopsies in tetany. Serous exudation
the cervical cord and into the ventricles of the brain, sclerotic cha
spinal extradural hemorrhage, atrophy in the ganglion cells and ne
fibers, and proliferation of the neuroglia are among the condi
found, as enumerated by Dercum.

The subject has been variously viewed by those who have r
researches in this line (Langhans, Weiss, Gowers, Schlesinger,
others), and little other than speculations are offered. The facts
scanty as yet, and it is better to content ourselves for the present
the view that tetany is due to the effects of a toxin or toxins upon
entire nervous system in one so predisposed.

Romme, reviewing the claims of various authors as to the etio
of tetany, concludes that the views of Kassowitz and his school
it is a manifestation of rickets) and those of others who would as
the condition to any especial primary disease are incorrect, as ther

no constant postmortem findings in tetany, and it occurs in connection with various diseases. As we have mentioned, Escherich and others have found hemorrhages in the parathyroid glands.

Clinical and pathologic studies tell us only that the main symptoms are evidences of mechanical or reflex hyperexcitability of the cord and peripheral nerves due to a diversity of causes.

In an analytic study of 6822 children, with special attention to determining the nature of tetany and its relationship to rickets and laryngeal spasms, Cassel[1] found 60 cases of tetany. The nutrition was good in 14, moderately good in 13, poor in 23, and bad in 10. All presented spontaneous intermittent spasm, which could be induced by pressure upon the large nerves and vessels of the affected parts. In all but 3 the facial phenomenon was present. Only 2 had laryngeal spasm, and both of these presented craniotabes in addition to other symptoms of rickets. Without exception the children were nervous and slept badly. Fourteen presented a rise of temperature; in 9 the disorder was the result of complicating conditions and in the remainder it arose without apparent cause. In 21 cases digestive disturbance preceded or accompanied the tetany; in 5 there was chronic dyspepsia, in 43 digestive disorder, in 6 obstinate constipation, and in 4 habitual vomiting. Rickets was present in 52 of the 60 cases; in only 8 there was no trace of rickets. Tetany was seen throughout the entire year, although the largest number appeared to occur in the spring and late autumn. There was no suggestion of an epidemic occurrence of the disease, nor was there any relation as to frequency between tetany, rickets, laryngeal spasm, and craniotabes. Cassel concludes that tetany is neither a complication of rickets nor of digestive disturbance, but is dependent upon unfavorable conditions of living, improper nutrition, and bad air.

The evidences point to the conclusion that tetany is a disorder of the nerves, somewhat generally distributed, and of toxic origin. The probable exciting cause is found in calcium metabolism.

Symptoms.—The symptoms of tetany are to be divided into those of the attack and those of the period of latency. The onset of the paroxysms may be preceded by sensory phenomena, but is often sudden and without warning. The sensations are usually vague tingling pains in the forearms and legs, followed soon by a tonic spasm or a stiffness in the muscles. This spasm is most marked in the upper extremities, giving rise to such a pronounced rigidity that it is almost impossible to overcome the resistance by active effort on the part of an-

[1] "Deut. med. Woch.," Jan. 28, 1897.

other. Occasionally the adductors of the thighs and arms a causing the arms and legs to be drawn together; more rarely of the neck are involved, and also those of the face and tru says the only true pathognomonic symptom is spontaneous i paroxysmal muscular contractions. The most common s contractions is in the muscles of the forearms,—the fingers at the metacarpophalangeal joints, while the phalanges ar the thumbs being strongly the wrists acutely flexed, an turned to the ulnar side. T of the hand is called the " hand" or the "writing han attitudes are, however, seen, such as a firm clutch complete extension of the fin former has been graphicall as the "driving hand." T may be flexed upon the ar adducted at the shoulder.

FIG. 93.—PEDAL SPASM IN TETANY. The patient was a fat rachtic infant. In her case, the hand took the position of the "driving hand."—(*Philadelphia General Hospital.*)

If the lower extremities ved, the thighs may be ad legs extended or flexed; the to assume the position of t nus. The spasms may affe cles of the abdomen, the ba phragm, and the thoraci hence inspiration is endan cyanosis may result, even ness being lost (Weiss). rare, yet opisthotonos is not Other muscles may be affe the eyes, the esophagus, th the larynx, or even the bladder. Laryngeal spasm is a com paniment of the disorder. Naturally, this degree of overt cause muscular pains. The degree of spasm varies, and als It may last from two minutes to two hours or more. As ha the involvement of the muscles is symmetric. Cases ha ported of one side only, or unilateral for a time. In the muscles fibrillary twitchings have occurred; clonic movem never. Tremor is common. The spasm begins in the pe from within outward, as in tetanus; nor are the masseters ea

as in that more serious malady; nor is reflex excitability high; nor is the spasm continuous as in tetanus. During the intervals the patient is comparatively comfortable. The muscles are often tender and sore, and they are weakened. The intervals are variable: usually a few hours, or it may be several days or weeks. Other signs are those of Trousseau, Chvostek and Erb. The "Trousseau phenomenon," we have rarely failed to elicit. It is obtained by pressing upon a large nerve or vessel of one of the extremities, or by making circular compression of a whole limb. Affected parts, particularly the hands, fingers, feet and toes then take their characteristic positions. The sign is of much value in cases of so-called latent tetany. Chvostek's sign is rare in children. It consists in an extraordinary susceptibility of the nerves in tetany to mechanical impressions. For example, a blow with a percussion hammer over the facial nerve produces a twitching of the angle of the mouth or of all the muscles of the facial distribution.

The third important sign of tetany, known as Erb's sign, is a greatly exaggerated electric excitability of the nerves. Weak faradic or galvanic currents produce muscular contractions in excess of the normal response. Cathodal closure contractions are found with small currents, but also with moderate currents; also cathodal closure tetanus and anodal opening tetanus, which are not observed in any other condition.

The most convenient test, and one which usually suffices in an affected person, is the increased mechanical excitability, a simple touch, a light pressure on nerve, being enough to produce contractions in the muscles supplied by it. It is less painful to the subject than to induce an attack by pressure on a large trunk or artery (B. Sachs).

Sensory phenomena are few; there are no disturbances of cutaneous sensibility. Headache, vertigo, nystagmus, and tinnitus aurium are described as coexisting. Temperature elevation is only rarely produced, but may be present because of some underlying condition.

Respiration is not, as a rule, affected. Dyspnea is sometimes produced by fixation of the muscles of the thorax and the diaphragm. The pulse is often increased in frequency. The urine is rarely affected; it may be increased in amount. Nephritis occurs occasionally. There are seen, at times, certain nutritive disturbances affecting the hair, nails, etc. The reflexes do not show any characteristic alterations, and are, as a rule, normal.

The duration of an attack of tetany is most variable. There may be many remissions of greater or less severity, of shorter or longer periods of abeyance.

Diagnosis.—The clinical picture of tetany is thoroughly characteristic, and should be easily recognized.

The position of the hands, the fingers grouped together or held rigidly in this or some other attitude, as in extension, the legs which are oftentimes affected as well, or both arms and legs firmly adducted should instantly excite suspicion. On investigation the sign of Trousseau would reveal the condition, even during the periods of latency that of Chvostek (irritability to slight mechanical stimuli) and that of Erb (electric excitability, as described) should make the diagnosis clear. Morse regards the one symptom pathognomonic of tetany the spontaneous intermittent paroxysmal contractions of the muscles of the forearms.

Not all the characteristic symptoms are seen in every case, and the absence of some one or other does not vitiate the diagnosis.

Prognosis.—The prognosis of tetany, on the whole, is favorable. Most cases recover. Sievers notes two fatal cases which occurred in connection with dilatation of the stomach. In both there were stenosis of the pylorus from healed ulcers and enormous dilatation.

In all the reports of fatal cases of tetany, twenty-seven in number, there was usually found dilatation, due to stenosis from scars of pyloric or duodenal ulcers, or ulcer and scar without stenosis. Those cases which follow extirpation of the parathyroid glands are usually fatal.

Treatment.—If rickets be accepted as the underlying cause, it is plain we must determine what has produced that disease; and the findings of the foremost clinicians yet are limited here, also, to must the same factors as give origin to tetany. The disorder is one child of excess of motion; and prodigality of motion—as we have constantly maintained, in dealing with disorders of motion, such as chorea—always followed by exhaustion (fatigue neurosis); hence the fundamental need for all such states is absolute rest for both body and mind. The next indication is to remove all sources of peripheral irritation. The mass of evidence is in favor of gastro-intestinal irritation being the chief factor; hence the digestive organs will need fullest attention. As toxins are admitted to be causal factors in the production of tetany, eliminants are also in order. A few well-directed doses of calomel will meet many indications. Calcium chloride may be given, as some have suggested; but we have had some brilliant results with calcium lactate, and prefer that salt. One undernourished baby had pertussis, laryngospasm and tetany. Both of the last disappeared like magic with the employment of grain doses of calcium lactate. If the spasmodic phenomena are excessive or painful, it is well to proceed on

same lines as in dealing with convulsions. The inhalation of chloroform, or a mixture of chloroform, nitrite of amyl, and ether (parts 3, 1, and 5), will hold the spasm in check. Sedatives, such as the bromids, chloral, and hyoscin hydrobromate may then be used, or, possibly, morphin hypodermically. Finally, nutritive tonics will be required in most cases, and to be maintained for a long time. (See Convulsions.) It goes without saying that the diet must be adjusted carefully in every case.

HYSTERIA IN CHILDHOOD AND YOUTH

The tendency during late years has been to make the diagnosis of hysteria much less rashly than of old. The time was, and quite recently, when a large number of puzzling functional affections were called hysteria and treated as such. Increasing knowledge of the disorder is correcting this unfortunate mistake. True hysteria occasionally occurs among children, in whom it is sometimes seen in a very graphic form, in boys as well as in girls, although twice as frequently in the latter. It increases steadily in frequency of occurrence from the third to the thirteenth year, and no age is exempt. The popular idea of this affection is that it is a mere feigning of disease, though hysteria, while simulating many disorders, is never a true imitation of any. It is a psychosis with clearly defined stigmata, physical and psychic. Hysteria may be described, then, as a functional disturbance of the nervous system due to no known structural lesion, manifested by paralyses, convulsions, psychic and sensory disturbances, and impairment of vision. The early recognition of all the neuroses of childhood is peculiarly important. This is especially true of hysteria, which, if unchecked, seriously modifies character growth and psychic development, as well as obscuring the diagnosis of other diseases.

Etiology.—In almost no other disorder do we see the influence of remote causes so admirably illustrated as in the hysteria of children. A neurotic ancestry of howsoever wide a variety may be manifested in the child in this form. It is rare, if not impossible, for children to be thus affected unless there is evidence of neuropathic ancestry, along with debilitating conditions or emotional strain. It readily happens, too, that a powerful example may produce a hysteric outbreak in an apparently well-balanced child. The influence of environment is a most potent factor in the production of hysteria. Exciting causes are exhausting conditions, depressed health from acute diseases, injuries, abusive treatment at the hands of others, overwrought emotionality, and objectionable education generally, especially in religious matters. A very important study for the general practitioner is to

search closely into the hereditary and other causes of all the neuroses in children, and it is also a very essential part of his duty. Whenever there is recognized ancestral alcoholism, insanity, or "marked peculiarities," the children must be doubly watched and guarded.

Hysteric symptoms are frequently seen during convalescence from infectious and other acute diseases. Imitative paralysis, contracture, tremor, and persistent local pain or tenderness are likely to follow various injuries, even very trifling ones. Vexations, disappointments, fright, shame, and, above all, religious excitement, are often potent factors in the production of psychic disturbances. An early encouragement of religious thoughts and training, especially of a kind which cultivates emotional exaltation, is powerful for harm in this direction. Perhaps the very worst influence of all, because more constantly present, is unwise, especially careless, home influences, lacking in systematic and watchful control, encouraging selfishness and minor deceptions deemed necessary by the child to secure what is coveted. Lax regulation as to duty and the higher moral faculties is the atmosphere most congenial to the growth of hysteria and even worse things. However, it must not be inferred that hysteria is solely the outcome of individual blameworthiness, nor is it always the result of lax moral conditions; for, on the other hand, puritanic severity is capable of working a large measure of harm. Disorders of the generative organs, especially those resulting from masturbation, are important causative agents about which much might be said, especially as parents are singularly unwilling or unable to control habits of this kind.

Symptoms.—By far the most important elements in hysteria are the psychic phenomena, which are exceedingly varied and complex, and, to a trained observer, capable of clear differentiation, and yet, when superficially studied, appear a mere mass of mental disturbances, imitative procedures, pretense, and deception. It must first be recognized that hysteria is not a simple feature of degeneracy, but a condition which may be acquired by children of unimpeachable parentage and otherwise excellent health. The child subject to hysteria is markedly impressionable, with a great tendency to accept and act upon suggestion. There is a dissociation of the higher mental faculties, as of volition from lower emotional and impulsive states. The actions of a hysteric child during the paroxysm result from morbid concepts of associations of ideas, which permit the organic activities to exhibit characteristic irregularities. The key-note to the whole situation is suggestion, both in the production of the psychosis and the emancipation of the sufferer. Morbid suggestion from without or within, one

or the other, or both, produces the malady and encourages its continuance; and wise, forceful suggestion from without will effect a cure, especially if accompanied by well-chosen auxiliary measures systematically applied.

The paroxysm of hysteria consists of certain definite steps or procedures which continue from prodromal states with regular gradations to a systematic culmination, or they may be checked here or there, producing even more extraordinary features.

The paroxysm or hysteric fit has acquired the reputation of being the most important manifestation of the disorder, because it is the most conspicuous. It may, however, be absent or only rarely observed, or, again, but atypically exhibited.

The hysteric paroxysm usually begins with certain antecedent features, mostly changes in the mental state, a shifting of the mind from its normal plane. There is never absolute unconsciousness. The exciting cause may or may not be apparent; if not, the point of departure of the fit may be some autosuggestion.

The fit follows close upon an aura, which may be either sensory or motor. It may begin abruptly, or be preceded by alternate laughing or crying. It usually begins with a subjective feeling, as of a lump rising in the throat, (globus hystericus) which is accompanied by a sense of suffocation. Another form of aura consists of loud noises, throbbing or beating sounds in the ears; still another is violent headache, a boring or piercing pain, as of a nail being driven into the head (clavus hystericus). At other times there is dimness of vision or alarming dizziness. Again, there may be sensations connected with the ovaries or testicles. The fit proper is usually divided into periods. The first or convulsive period resembles epilepsy, but is in no sense identical with it. The patient sinks down or falls supine upon the back, with the limbs extended and rigid, but with the fingers and toes flexed; the eyes are usually rolled slowly from right to left, or crossed; the jaws are firmly closed; the breathing becomes slow and labored, and later hurried, the face flushed or bluish, the neck turgid; the cardiac action becomes more rapid and forcible, and consciousness is blunted or even almost, but never entirely, lost. Sensation is much obtunded, and abolished in some portions of the body. Soon clonic movements succeed—a tremor affecting the muscles of the trunk, extremities, and face. This alternates with electric-like startings, during which the patient may fling himself furiously about or actually out of bed. Presently this stage ends with sighs, and is followed by a short sleep.

The next stage is one of dramatic movements, not so commonly

seen here as in Europe. These may appear by themselves, and expla some otherwise puzzling conditions. The most common form is complete opisthotonos, tonic spasm of the muscles of the back, a bowi of the lumbar curve until the child rests only upon head and hee This may alternate with, or be replaced by, a variety of quaint attitud and movements, some of which simulate purposive acts; others a merely automatic. The final or closing period of the convulsive atta is one of delirium. This is usually an expression of the dominati mental attitude, and likely to be reproduced in each succeeding f It usually expresses some condition of fear or sadness, manifested tears and sobs and more or less incoherent appealings or pleadin The attack is not always complete: one period may be exaggerat and the others left out. Especially in children, certain acts may habitually performed, or changed by suggestion until the combinatic are most extraordinary.

A series of apparently purposive movements or merely autom acts may originate in one individual, and be so powerfully suggest to others that they unconsciously imitate them, and thus a wi spread contagion occurs in religious communities and schools, such gave rise to the dancing manias of the Middle Ages. Somnambul should be mentioned as having points of contract with the hyst state. A lethargy also sometimes follows the paroxysm. Catalep another psychosis strongly resembling hysteria, may be observed dur or after the hysteric fit. The duration of a paroxysm may be bu few minutes, and then, with intervals of rest, be succeeded by oth as many as two hundred attacks having occurred within twenty-f hours in a case recorded by Scahs; or it may last longer, as in a c observed by the authors, in which the attack continued for the gre part of two hours. Those which occur fragmentarily, or present c siderable variety in their manifestations, may continue, with aln no intermission, day in and day out, as in the epidemic which occu in the Church Home of this city while one of the authors was on c there.

The hysteric paroxysm, as has been said, is not the most impor symptom of hysteria. The permanent markings (stigmata) of hyst have to do with changes in sensation, motility, the activities of viscera, the mind, and nutrition. Alterations in sensibility are ne always present. Hyperesthesia and local tendernesses are comn as in the well-known hysterogenetic zones. These zones and a of exalted sensation, over which, if pressure is made, pain is produ and some one or other of the more graphic motor manifestations

elicited; the most common of these are over the ovaries and spine. In boys the testicles are sometimes hypersensitive. Pressure over these zones may give rise to a convulsion, or, again, may cause them to stop. A hysteric pain caused by an old injury may act as a hysterogenetic zone, especially of the joints, as the hip or knee.

Disturbances or alterations of sensation are characteristic of hysteria. Anesthesia, more or less complete, is nearly always present in the hysteric subject, who may often be ignorant of its presence. Sometimes this is only of one side of the body, divided with great exactness in the middle line from head to heel (hemianesthesia); and sometimes occurs in irregularly distributed areas (disseminated anesthesia); or, again, is distinctly localized in one arm or one leg, (segmental anesthesia). This last may be accompanied by motor impairment (palsy) of the part. The areas of anesthesia, when pricked, do not readily bleed (ischemia). The organs of special sense are often disturbed in hemianesthesia, and always upon the affected side. Of these the most important are the eyes; there may be a concentric narrowing of the visual field, or an alteration or reversal in the color-fields (amblyopia or color scotoma). There may be deafness of one side, or impairment of smell or taste. The changes in the color-field, when characteristic, are one of the most certain points for differential diagnosis.

The disturbances of motility in hysteria are either loss of function (paralysis) or perversion of function (contraction and tremor). These symptoms are very apt to appear by themselves. The paralyses of hysteria simulate those due to central nervous disease in their distribution, but not in their clinical history. They may be named in the order of frequency with which they occur in children—viz., paraplegia, monoplegia, and hemiplegia. The paralysis of motion is commonly, but not always, accompanied by paralysis of sensation. The onset is usually sudden, and in form may be flaccid or spastic. The immediate cause is usually some emotional perturbation, which may be psychic or traumatic. The contractures in hysteria may be either partial or complete, a local stiffening or a spasm. These contractures may persist for years, though not always constant, and sometimes returning upon slight excitation; they may remain in the same place or pass from one part to another. Tremor is rare in children; loss of voice is not common, neither is increased rapidity of respiration (tachypnea). Hysteric vomiting, also rare in the young, is a very serious matter when it does occur, imperiling health or even life. Its character is *sui generis* a mere regurgitation, due to a spasm of the esophagus. The intestine is sometimes paralyzed in hysteria, producing an immense

bloating, with noisy belching, which is usually concomitant with a condition of emotional excitement.

Hysteria is a psychosis, a profound disorder of functional activities, of almost universal distribution, but due to no known demonstrable lesion. By some change in mechanism an entire half of the brain is temporarily invalided, which alone can explain the complete hemianesthesia. The possibility of transferring this anesthesia from one side to the other would show the two halves of the brain to be in sympathy one with the other. The cortical inhibition is lessened, leaving the lower centers unchecked. Recently expressed opinions upon the mobility of the neuron enable us to reach a clearer understanding of hysteric states, but as yet scarcely explain the accompanying phenomena. The hysteric child evidences a marked vulnerability to certain perturbing influences, is always susceptible to psychic changes and functional disturbance. The manifestations of the disease may disappear during many years and yet readily recur under the influence of slight morbid agencies or changes in condition or emotional irritation.

Treatment

The treatment of hysteria in children or in adults is always complicated by the fact that the causes which produce it have so much to do with environment. It is difficult, almost impossible, to effect a cure unless the unfavorable environment is changed. It is easy to point out how a case may be benefited or cured, but not so easy to enforce the measures with sufficient thoroughness to produce a satisfactory result.

Bosnia, in "The Paidologist," April, 1900, says: "Medical science employs three methods in these cases: (1) *The method of startling.* The child is overpowered by a simple and powerful command. (Stand up! Speak loud! Don't cough!) There is no time left for the child to be ill. (2) *The method of premeditated neglect:* The doctor does not take any notice of the child, so the child gets tired of self-thoughts and forgets his illness. (3) *The method of disguised psychic means* (hydrotherapy, electricity, mild corporal punishment): This therapy is based on the faith the patient has in the treatment. It is more efficacious in adults than in children. Electricity and cold water benefit children, inasmuch as the processes are more or less painful. They fear a repetition, and this fear is often strong enough to banish the pathologic ideas and the morbid symptoms arising from them."

The most important point in treatment, to be always insisted upon, is a complete separation of the child from its parents or previous care-

takers during a considerable period of time. The physician finds himself in a very difficult situation, and will usually be compelled to compromise. Indeed, it may sometimes be wiser to do this, and then gradually lead up to other measures more and more efficient and complete. The first part of the treatment should consist in the systematic application of measures directed to the improvement of general health, which may not seem obviously much impaired. An essential factor in the production of a cure is a properly qualified nurse or, in rare instances, a wise and patient member of the family who can be taught to exercise the necessary control. The next most important element in the treatment is moral training, a complete remodeling of the point of view of duties to self and others.

Bosnia, *op. cit.*, says: "Wrong education is a most powerful factor in the causation of psychogenic troubles, especially in cases where a natural disposition toward them exists. If, through wrong education, moods are not suppressed, good habits not established, training of will-power neglected, and the imagination allowed to run riot, we are in great danger of cultivating the neurasthenic soil on which all sorts of psychogenic affections may grow up."

It is of the greatest importance for physicians to realize that drugs are of no value whatsoever in the treatment of the psychosis known as hysteria. Judicious reasoning, frank conversation of an educational kind, and vigorous suggestions, with sometimes the added pomp and circumstance of the proper place and conditions, are powerful agents for good. Thus, a steady repetition of suggestion, with judicious and thorough detail, by a nurse or attendant trained to this end, is of great efficacy. As soon as the severer symptoms are overcome and the child restored to uniform good health, proper educational measures must be steadily pursued. Remedial measures directed to the removal of functional disturbances—for instance, hydrotherapy, electricity, especially the static form, massage, and regulated exercises—are of direct value. Strong faradic applications help to overcome hysteric paralyses, particularly in conjunction with encouraging words. The manner assumed by the physician exerts the utmost influence for good or evil. A frank, candid exposition of the patient's need should be clearly given. The medical man should be recognized by the patient as most kindly disposed, encouraging, and yet relentlessly firm.

For the sensory disturbances the cold douche, or alternate use of hot and cold water, or the employment of some of the more picturesque devices, such as metallotherapy, may prove beneficial. Hypnosis will control a certain proportion of phenomena, and is rather easy to

produce in children, who at best are very impressionable, but is r more efficient than repeated, direct suggestion at the hands of a phy cian whom the child has learned to respect and esteem. To overcor a paroxysm or convulsion the following measure may prove efficie Iced water dashed repeatedly over the face or back, or trickled stead upon one point, as from a small hose or watering-pot; pieces of i rubbed here or there on the back or chest, and lastly, inhalations ammonia or nitrite of amyl. Pressure over ovarian region or in i framammary regions, likewise pressure over the vertex, sometin stops grave attacks.

MIGRAINE

Migraine, megrim, hemicrania, or sick headache is an exceedin troublesome neurosis and occurs frequently in children. It is char terized by occasional attacks of headache, often of one side, with wh are associated nausea or vomiting and peculiar visual disturbanc vertigo, and sometimes alterations of sensibility.

Etiology.—Migraine is usually inherited, either in its own fo or as a tendency to neuroses, among which epilepsy and hyste are prominent. The disease usually begins early in life, most ca between twenty and thirty, but some between the fifth and tenth years, and more frequently in the female sex. Though cannot believe that visual causes are responsible for all cases, i certain that such are present in a fair proportion of cases. The e should always be cared for by a competent opthalmologist. Excit causes are emotional disturbances, worriment, fatigue, and disor of digestion.

The predisposing causes of migraine are overwork, anemia, general debility, which latter may be primary or be the seque some constitutional disease, not infrequently the acute infecti

Pathology.—The pathology of migraine is not known. It is, h ever, a cerebral affection closely allied to a sensory epilepsy. T are many reasons for believing that changes in the blood suppl the brain or its coverings are primarily responsible for the sympton migraine, and that the sympathetic nervous system is largely invol In addition to the view of its vasomotor origin some observers a that there must be an inherent alteration of the nerve-cells of the br It is a curious fact that whereas in a person subject to migraine cha in the vasomotor apparatus are capable of producing this nerve st yet in one without this tendency no such effect is produced. resemblance between migraine and epilepsy is so close that they

represent different degrees of affection of the cortical structure. Again, it may be possible that the effect of differences in the amount and quality of the secretion of certain glands, as of the thyroid, adrenals, or spleen.

Great care should be exercised in the examination lest some cases of migraine be met, not so typical, which may be confused with what will prove to be a trifacial neuralgia.

Symptoms.—The attack may come on rather slowly or quite suddenly, by a physical depression more or less obvious, pallor, chilliness, or disturbance of sight; then comes the head-pain, gradually increasing, and lasting for a few hours only or for a whole day. Vomiting or nausea usually accompanies the headache, but this may be absent, or the nausea may be present and the headache absent—this especially in atypical attacks. Irregularities in the train of symptoms are more likely to be seen in younger children, increasing in severity and completeness of the clinical picture as puberty approaches, after which time it usually persists until early middle life, when, happily, it not seldom disappears. The most characteristic phenomena are the unilateral headache, the sudden and extensive pallor, and the visual symptoms, often transient hemianopsia or hallucinations of sight. The nausea and vomiting are very like those due to cerebral irritation, and sometimes mark the culmination of the attack, followed by relief, and sometimes, again, not; for the pain and vomiting may continue uncontrollable, until the sufferer longs for death. The most interesting symptom is the visual disturbance, coming on sometimes at the very beginning, or persisting throughout the attack. This may appear as flashes of lightning for the first symptom, startling the patient. Others see bright zigzag lines, balls of fire, or figures of different shapes, the same sometimes recurring in subsequent attacks. Others suffer more or less loss of sight, sometimes complete blindness or intense photophobia. Some patients are relieved by being in a dark room and in such cases, relief may be permanent after careful refraction, and the wearing of proper glasses (Gould). Possibly the tendency to disappear in middle or late life is accounted for by the presbyopia of later years. It is to be recalled, however, that no matter what the exciting cause may be, there is usually an underlying neurosis, so no roseate promises should be made the patient when a refractive error is found. The vasomotor phenomena are often prominent: usually pallor of the surface and coldness of the extremities, or the surface may be extremely flushed, and these may alternate in the same attack. When the explosion has spent itself, there follows a considerable exhaustion, as a rule, yet in other cases the patient feels storm-swept and relieved. Critical

discharges may follow the cessation of the pain. (Diureses, diaphoresis, etc.) There are many things in the attack which resemble the explosion of an epileptic paroxysm; but unlike the latter, which tends to get worse, migraine is ultimately outgrown, as a rule, and the sufferer does not exhibit the marks of a degenerate. The attacks are apt to recur with more or less regular periodicity.

Prognosis.—The prognosis in migraine should be guarded. Some cases will continue to have attacks more or less periodically until old age is attained. Nevertheless, treatment by the ophthalmologist and a study and regulation of every phase of the patient's existence may yield some brilliant results.

Treatment.—For the treatment of the attack very little can usually be done that is at all satisfactory. The stomach usually empties itself, and it is difficult to administer medicines which shall be retained by that organ. Hypodermically many drugs can be given which relieve; of these, small doses of atropin, hyoscyamin, or hyoscin hydrobromate from 1/500 to 1/150 of a grain, are useful. The nitrates have, in our experience, given satisfaction; nitroglycerin, 1/300 to 1/100 of a grain along with hyoscin hydrobromate, has afforded in our hands much relief. If the stomach will retain them, a host of remedies may be tried, some one or few of which may be found to relieve the individual case.

One of the best remedies for some is an infusion of black coffee without sugar or milk. Elixirs and syrupy things are liable to disturb digestion, already imperiled. Powders or plain solutions of the coal-tar derivatives suit some people; and a mixture of phenacetin, 15 grains; caffein, 1/2 grain; codein, 1/6 grain; bicarbonate of soda, five grains, repeated every hour, is beneficial in some cases. Nitroglycerin or the hyoscin salts may, one or both, be given with this, and if the heart is quite weak, three to five drops of tincture of strophanthus. Aromatic ammonia relieves some instances, especially if the stomach is overacid. It is best to avoid strong-tasting preparations. Morphin and alcohol should never be given these sufferers.

The constitutional treatment of sufferers from migraine must receive careful attention. Examination of the eyes and proper correction of refraction errors may happily relieve in some cases.

HEADACHE IN EARLY LIFE

Synonyms.—CEPHALALGIA; NEURALGIA; PAIN IN THE HEAD, E:

Etiology.—Most authorities are agreed that infants and young children suffer little from headache except in the presence of brain diseases. (See Meningitis, Sinus Thrombosis, Brain Tumor, etc.)

In children of the school age, however, headache is rather common; d as puberty is reached, it becomes a frequent complaint, particularly girls.

The causes of such headaches are numerous, and they have been ifferently classified by different authorities. Thus Holt makes a onvenient grouping of the causes as toxic, anemia and malnutrition, ervous, from the organs of special sense, gout or rheumatism and isturbances of the genital tract. Pfaundler offers the most complete lassification with which we are acquainted, and we submit it forth-vith:

A. *Accidental Causes (Occasional).*

1. Affections of the cerebro-spinal system.
   a. Circulation of the brain (anemia, congestion, sinus thrombosis, violent coughing).
   b. Meningitis.
   c. Cerebral tumor.
   d. Polio-encephalitis.
   e. Brain abscess.
   f. Syphilitic sclerosis (worse at night).
   g. Embolism and cerebral hemorrhage.
   h. Traumatism.
2. Functional neuroses.
3. Acute infectious diseases (notably grip, tonsillitis and malaria).
4. Acute intoxications.
   a. Ectogenous (many poisons, particularly CO_2).
   b. Endogenous (uremia, constipation, etc.).

B. *Habitual.*

1. True migraine.
2. Conditions similar to migraine. Here we have the underlying basis of neurosis, and many exciting factors, such as eye strain, indigestion, constipation, adenoids, etc.

C. *Intermediate Forms.*

1. Neuralgia in certain areas of the head and face.
   a. Ophthalmic or temporal (eye strain).
   b. Supramaxillary (toothache).
   c. Inframaxillary (toothache).
   d. Occipital (brain tumor, eye strain, etc.).

2. Injuries of nerves (mechanical, infectious, toxic and rheumatic).
3. Progressive paralysis (Friedreichs ataxia).
4. Diabetes mellitus.
5. Hysteria.

Many of these causes have been considered, as in our studies of meningitis, brain tumor, nephritis, etc. It remains for us to lay stress upon a few common causes. Cornell, speaking from his experience in the Philadelphia Public Schools, says that four-fifths of the headache in school children are dependent on eye strain. Constipation is another common cause. So many children hurry away to school in the morning without receiving proper nourishment, and without opportunity to obey the calls of nature. In the school life itself, we quite agree with Forsythe that imperfect ventilation accounts for a great many headaches. He depicts the child suffering from CO poisoning as bright-eyed, flushed of cheek, poor of appetite, lacking energy, always tired and complaining of frontal headache.

Anemia and malnutrition account for many of the headaches of adolescence. With some girls at this age, the headaches suffer acute exacerbations with the monthly periods. Headaches are common with the acute infectious diseases. Most of them are toxic in origin and probably disturb the cerebral circulation; but in epidemic influenza sinus congestion may be responsible for severe frontal or orbital pain.

Symptoms.—To discuss the varied symptomatology here is obviously out of the question; but such symptoms as flashes of light, relief in a dark room, inability to see the blackboard, relief in the open air, relief after purgation, appearance of headaches at puberty, etc., should not escape the observant and painstaking physician. Rather, they should inspire him to intelligent and painstaking efforts to relieve.

Diagnosis.—To attain success, the medical attendant should first know the causes of headache in childhood. Then he should obtain a careful history of the malady, its possible antecedents and attendant phenomena. Among other things, he should not forget to investigate every phase of the child's personal hygiene in home and school. Lastly he should make a careful physical examination, and should supplement his personal study with ophthalmologic and rhinologic investigations; and with a study of the urine.

Prognosis.—This of course depends upon the cause or causes and upon the removability of these causes. Migraine leads us to conservative prognoses, particularly when it has persisted through preceding generations. Even though some reflex factor is clearly the

citing cause of headache, do not promise relief too hastily. Remember that some vice of nervous or somatic constitution may remain to defeat our best efforts.

Treatment.—This has been indicated. We search for the origin of the headache, and try to strike the trouble at its source. Skilled refraction, removal of adenoid growths, draining of infected sinuses, massage for rheumatic nodes (Yawger), the direction of a careful hygienic regimen, tonics and good food and fresh air. These are but a few of our most effective therapeutic measures. For immediate relief, the coal-tar products are often of signal service, particularly combinations of acetphenetidin and monobromated camphor. It need scarcely be said that opium and its alkaloids should only be employed in the excruciating headaches of mortal diseases like meningitis and brain tumor. To those who use such drugs lightly, we would commend the sad story that began in the boyhood of De Quincy.

SPEECH DISORDERS OF CHILDHOOD

Briefly, we shall consider late and imperfect acquirement of speech, stammering and stuttering.

Late and Imperfect Acquirement of Speech

A very common cause of delayed acquirement is found in lack of necessity for this mode of expression. The infant in his second year does not speak because he does not have to. By signs and by grunts, unintelligible to others, he succeeds in making his wants known to parents and they hasten to do his bidding. We have seen this often in the pampered first-born, and also in the youngest members of large families. In the latter case, all of the other children interpret the baby's wants and supply them. Under such conditions, we have seen speech development delayed for two years. The cure is simple. Desired objects are withheld systematically from the baby until he makes an effort to pronounce their names. It is marvellous how quickly speech is attained when the infant perceives the need of it.

Rickets is probably the most common cause of late acquirement of speech. The rachitic baby learns to talk late just as he learns to walk late. The treatment is the treatment of his faulty nutrition.

Congenital or acquired deafness may account for mutism. Indeed one should never decide the question of absent speech without determining whether or not the child is deaf. . We shall not enter into the

question of treatment here; for this is a matter for the trained specialist and every deaf child should be accorded, the special attention that he needs. Most large cities, and all of our states can supply such training. We shall never forget a demonstration given before one of our medical classes by Mrs. Anderson of Swarthmore. The subject was a boy in the third year of life, who was born deaf.

If some speech development is not obtained at two years, and the causes mentioned can be excluded, some form of mental deficiency is almost certainly the cause. Cretinism, mongolianism, infantile hemiplegia or diplegia, and agenesis corticalis are the most common types of deficiency accountable for such delay in vocal expression. Cretins usually learn to talk when treated. Mongolians usually talk somewhere between three and five years. Hemiplegics and diplegics learn to talk late; though their speech is nearly always slow, almost scanning and incoordinate. If a sufficient area of brain cortex is undeveloped or destroyed, the defective child may always remain speechless.

Word deafness is a rare cause of absent speech, though the child may have a normal mentality in other respects. Such children may be taught to speak.

In Friedreich's ataxia, and cerebellar ataxia, speech may be scanning and staccato in type (Whipham) as we have mentioned in our consideration of those diseases. In juvenile paretic dementia or cerebrospinal sclerosis, it may become scanning. Speech, once acquired, may be temporarily lost through surgical shock or acute illness. We have observed such loss most often in typhoid fever; but only recently we saw it after a severe attack of wandering pneumonia. Chorea is another disease that may be responsible for imperfect speech or actual loss of articulation.

Stammering and Stuttering

The distinction that Kussmaul draws between these two forms of imperfect articulation is probably the most clear. In stammering the subject has difficulty in producing individual sounds, and succeeds only after considerable effort. The stutterer, on the other hand, has difficulty with syllables, and reproduces a given syllable several times before he can proceed with what he started to say.

In late infancy, some degree of stammering is nearly always observed, the child outgrowing the tendency to stammer as he grows older. The tendency can be fostered and eventually transformed into a habit

life habit, however, by unwise efforts at correction, by faulty education or because the child himself is of a nervous, self-conscious type. Imitation may also play a part in the development of stammering.

Stuttering usually starts somewhere between three and six years of age. The subject who displays it is usually of the neurotic type, the family history often proclaiming this as eloquently as the child himself. Unquestionably, it is a deeply ingrained vice of nervous organization. The stutterer tends to grow worse as time passes. More than this, the knowledge of his infirmity makes him woefully self-conscious, particularly in front of strangers, and more and more he hesitates to express himself in speech. But expression of our thoughts tends, or should tend, to make our thinking more accurate. No one likes to speak his thought and have it viewed with ridicule or contempt. And so the stutterer hesitating to speak, ceases to think as often or as well; so he may actually degenerate mentally. The emotional strain upon the sufferer is often shown by the marked vasomotor reaction (blushing) that accompanies every effort at vocal expression.

Treatment.—The infantile stammerer usually improves as he grows older. An attitude of kindly encouragement, but nevertheless a firm attitude, will help him over difficult places. Later elocution and voice culture may prove inestimable boons.

The stutterer needs much more study and care. Begin by investigating his condition of bodily health, and his nervous and mental make-up. If he is ill-nourished, fresh air, good food and tonics may prove of great service to him. Adenoids and enlarged tonsils should be removed, and others defects in the respiratory or vocal organs corrected.

In general, he should be taught lessons of self-reliance. Boxing and fencing are excellent exercises for the stutterer. Self-reliance is also taught by obliging him to perform missions and tasks on his own responsibility. "Chumming" should be frowned upon, and he should not be permitted to become a youthful recluse. Rather, it should be seen to that he has an ever enlarging circle of acquaintances and friends, and that he plays his part in his juvenile world.

Elocution, voice culture and deep breathing exercises are of service to him; but as a rule they are not sufficient to develop coordinated activity in his motor mechanism of speech. Special methods must be employed. An advertising layman in Philadelphia acquired a great deal of credit and much more of this world's goods in his treatment of stuttering. He had an idea. It was the utilization of rhythm. The child marked time by swinging his arm and pronounced a syllable

with each beat. Many stammerers and stutterers improved while under this teacher only to relapse later on. Hudson Makuen has employed the element of rhythm in a much more rational way. He utilizes the consonants themselves to mark the time, and has the patient speak much as though he were scanning poetry.

Lisping is a common speech defect in infancy and childhood. For some sound that is hard to pronounce, the lisper substitutes some other sound. Training in speech, and attention to defects or anomalies of the upper air passages and tongue will produce good results.

CERTAIN BAD HABITS OF INFANCY AND CHILDHOOD

Thumb sucking or finger sucking is observed in most infants. It may continue far into the childlife. It may be observed only when the infant is asleep or going to sleep, or it may be almost habitual even during the waking hours. From several standpoints, the habit is such a menace that it should be broken up at an early period. 1. It is uncleanly. There is danger of introducing bacteria and other filth into the mouth. 2. It tends to produce deformities of the jaws, teeth and fingers or thumbs. 3. It favors mouth breathing and the development of adenoid growths. 4. It favors the development of onanism at a later period. Both finger sucking and masturbation are closely related to tactile sense, and we agree with Holt, that one habit favors the development of the other.

All that has been said of thumb sucking is equally true of the use of "comforts" and other sucking devices. It is impossible to give the care to a rubber "comfort" that is given to the nipple of the nursing bottle, and thrush and other contagions may often be traced directly to the use of such false comforts. We have known a baby to become accustomed to suck the sleeve of his mother's night gown. After he went to sleep, she was in the habit of substituting a piece of linen tied to a string. This foolish treatment was kept up until he was quite a large boy.

Thumb sucking may be overcome quite readily by several mechanical measures: Paste-board sleeves are very useful. They permit free movement, except at the elbow. One authority encloses the hand of the baby in a rubber ball, perforated for ventilation and lined with cheese-cloth. Some such device will break up the habit in about two weeks, though temporary relapses may be observed during dentition.

More dangerous from the mechanical standpoint is the baby habit of placing foreign bodies in the mouth. Most babies do this at some

time or another. Hair, string, pins, safety pins, etc., have often been swallowed by infants and young children. We have seen intestinal obstruction from newspaper, and from a ball of hair (hair ball) and leaves. Our latest find in a baby's stool was the eye of a toy German dog. Attached to this eye was a pin over an inch long. This baby showed no symptoms at all during its passage through his alimentary tract; but we have recorded one case of convulsions caused by much less dangerous foreign bodies. We have seen an ordinary pin transfixing a vermiform appendix. (Case reported by Drs. Williard and Jump.) At an early age babies should be taught that they cannot place everything in their mouths. Corporal punishment, applied to the erring hands, is very efficient in the achievement of this purpose.

Pica, or dirt eating, is occasionally seen in children. Usually such children exhibit depraved nutrition or gastro-intestinal disturbances. Indeed our forefathers thought that the child so afflicted was endeavoring to supply some deficiency or need in his system. Thus if the child picked plaster from the walls and ate it, he did so because his economy called for lime. We knew one little girl who ate the clay from the walls of their Adobe house in New Mexico. We knew another who ate much of the enamel from her white enamelled crib. Pica is also observed in the mentally deficient, and here the habit may be very difficult to cure.

These children should be built up and their digestions looked after. They should be removed from the environment presenting opportunity for the pursuance of the abnormal habit.

When discovered in the act of dirt eating, the patient's hands should be punished by slapping or by the use of faradic electricity.

Rumination (merycism) is occasionally observed in neurotic children. One boy, exhibited by Dr. Luther Peter before the Phila. Pediatric Society, could actually regurgitate the articles of food that he cared to masticate once more. Riesman has contributed a thorough and scholarly monograph on this subject. The child usually outgrows the tendency. Helpful suggestion may be of aid to him.

Masturbation (onanism or self-abuse).—Strictly speaking, masturbation is not a broad enough term, for the habit of self-abuse may be exhibited in divers ways, of which the manual method is one. Some form of onanism is exceedingly common in infancy and childhood and arises in a number of ways.

In babies, the habit is more common among girls, and it usually arises from irritation in the neighborhood of the clitoris. Decomposing smegma or smegma retained by clitoral adhesions are the common

sources of irritation. Seat worms may also account for reflex irritation, particularly when they wander into the vagina.

Among boys the habit may be early acquired, when some irresponsible nurse has practised it for the purpose of quieting the babies. This practice is said to have been all too common among the negro "mammies" of the South. Preputial adhesions or retention of smegma may again account for its origin. Older boys are more commonly taught the habit by still older companions. Some boys acquire the habit in climbing or in riding.

As previously stated, onanism may be practised in a number of ways. We have seen "thigh friction" in a seven months old female baby, and have studied a very intractible case at two years of age. In boys the parts are more commonly handled, just as some babies handle a prominent umbilicus. Still other children turn upon their abdomens, and go through movements like those of fornication. Others sit upon sharp objects or lean against them.

The habit may be practised many times a day, or may be pursued only when the child is going to sleep. Again, the subject turns on his abdomen and simulates the sexual act even in his sleep.

Usually the child goes off alone to perform the act. His face becomes flushed and finally he breaks out into a profuse perspiration. If disturbed before the occurrence of the orgasm, he exhibits irritability, anger, chagrin or shame.

Mental defectives may practise masturbation openly and without shame. The effects of masturbation are less marked than is commonly taught. In most children, it does not produce marked physical or mental deterioration. That it does do so in some cases, however, must be admitted. More commonly, children masturbate because they are defective.

In babies the outlook is good. In children, the habit is much more difficult of eradication. Careful removal of all sources of reflex irritation (smegma, clitoral or preputial adhesions, worms, etc.) is the first indication in good treatment. Then some mechanical device should be applied to prevent the performance of the act in bed. jacket to hold the arms; a cross-bar with belts to hold the thighs apart, a towel around the waist, knotted in front to keep the subject from turning on the abdomen, are a few such devices.

Children should be out of doors, activity up to the fatigue point. Climbing of poles or trees, horse-back riding (without a suspensory bandage) and bicycle riding are the only exercises on which the boy is placed. Exercise is employed to use up all surplus energy. Cor

panions should be studied and carefully watched. A light supper at night, and cold bathing before retiring are other useful measures. Camphor and bromides may prove of service at bedtime.

Head banging is often performed by children in fits of temper. Persistent head banging, however, is only seen in children who are mentally deficient. Terribly cut and bruised about the forehead as such unfortunates become, they appear as most pitiable objects. We are convinced that there are two causes of head banging. One is headache, and the other is comparable to other abnormal habits closely related to the sense of touch. The latter defective strikes his head, because it needs some exceptional stimulus to appeal to his obtunded sensibilities. He seems to take an unholy joy in the performance of the act. The habit is most persistent and may resist out best efforts at cure. Relief should be sought along three avenues. 1. Use some apparatus to secure fixation of the back and neck. 2. Exhaust the child's nervous energy in other activities—long walks, etc., and divert him with amusements, etc. 3. Render the abnormal activity objectionable to him. This we sometimes have succeeded in doing with the electric brush.

Body rocking is another abnormal habit often evidenced by mentally deficient children. We have observed it more often in microcephals than in other types of defectives. The habit is closely related to the child's inherent fondness of rhythm. Inferior races often exhibit it in religious ecstasy, etc. We "harness the activity" by striving to put it to some useful purpose like sawing wood, using a heavy floor mop, etc. Rewards are also offered for quietness in the class room, etc. One microcephalic boy was much improved by the present of a gun, with which he delighted to play soldier.

SLEEP ANOMALIES OF INFANCY AND CHILDHOOD.

Infants sleep badly from many causes. The infant's sleep is light; very different from the heavy sleep of childhood, and is very easily disturbed. Chief among the causes of interrupted sleep, we find bad training.

Infants rendered comfortable should *go to sleep*. They should not be *put to sleep*. Pain, usually of gastro-intestinal origin, is another common cause; but this should be met by adjustment of the food and hours of feeding, not by rocking, singing to and senseless parental perambulation of the baby. All such old-time methods of securing sleep are misdirected; because they strive to replace one

sensation by another, not to relieve the cause of the disturbance. Again, the baby may fail to sleep because he is hungry. The treatment is obvious; but it should not involve more frequent feeding.

Lack of fresh air in the sleeping apartment, undue warmth of the apartment, unduly warm or heavy night clothes and bed coverings, are other important causes of sleep disturbances in the tender years. Babies, particularly rachitic babies, may perspire at night and may struggle from under their bed clothes night after night. Instead of fearing that they "take cold," we should secure cooler, better ventilated apartments for them and should protect them with coverings of lighter weight. Chilling of the body surface may be avoided by using night drawers with feet, or sleeping bags (pouches). These facts too should lead us to advise that the baby have a sleeping apartment to himself. He should never be kept in bed with the mother.

Noises around the light infant sleeper, and bright lights in his apartment should be eliminated. In other words we strive to show consideration for a baby asleep just as we would for a sleeping adult. But on the other hand, we should avoid making "hush-babies" of infants. Too many parents whisper around the house when baby is asleep and tiptoe to bed as though bent on some criminal mission. If the infant is aroused by sounds, he should simply be let alone until he goes to sleep again. All babies are attracted by a bright light, and such should never be employed in their apartments. The night lamp or still better a light in an adjoining room will suffice for attention to nightly infantile needs.

Acute coryza may be responsible for disturbed sleep of an infant just as many an adult with a cold cannot sleep. It goes without saying that earache is an absolute destroyer of sleep. Difficult dentition, too, may prevent sleep, and is a fairly common reason for disturbed night rest for as much as a week or more prior to the eruption of a tooth. Headache, in meningitis, may be announced by the shrill, high-pitched hydrocephalic cry, even though the unfortunate baby remain asleep. Nightmares or bad dreams are of common occurrence in childhood. The child screams out in his sleep, and awakens much frightened. When parents or attendants reach him he usually tells them of the bad dream. We are quite convinced that some of the morbid fears of childhood have their origin in frightful dreams. The most common cause of nightmare is probably some obstruction to breathing (adenoids, acute coryza, etc.). Bad dreams however, may result from fever, indigestion, too heavy meals at night undue excitement at bedtime (fairy tales, punishment, etc.) and

number of other causes. We agree with Coutts that nightmare should be sharply differentiated from pavor nocturnus. The cure is found in detecting the cause or causes and in the elimination of such.

Pavor nocturnus or "night terrors" may be distinguished in several ways from ordinary nightmare. The affected child is usually of a neurotic type. He too cries out in the night; but when his parents go to his relief, they find him sitting up in bed or possibly crouching in some other portion of the room. He looks at them with pupils widely dilated, but with unseeing eyes. Recognition may come after a time; but on the other hand, he may go to sleep again without recognizing those about him. If he tells of his experience it will be found that the same frightful vision tends to reproduce itself in different attacks. Thus he may tell of fire; of a negro or black man who frightened him or of some terrible weight upon his chest. The following morning he may have no recollection of his night's experience.

The same causes that induce nightmare in one child may be responsible for pavor nocturnus in a neurotic subject. In some cases, however, we do not believe all, the affection is related to nocturnal epilepsy, and it may pass over into convulsive seizures at a later period.

If adenoids are present, they should always be removed; though the problem requires investigation of all the other factors mentioned in speaking of the milder nightmare.

In addition to these measures, the child may require much attention to his nervous make-up, and may need sedatives (bromides) at bedtime.

Somnambulism or sleep walking is not common in childhood; but we have observed quite a number of instances of it. One of us saw a boy in Colorado, who would often go to sleep downstairs. His mother, finding him asleep, would command him to go to bed. With closed eyes, he would proceed to his room, would undress and go to bed. The following morning he would have no recollection of what had occurred the night before. He would only remember going to sleep downstairs. Another boy often walked downstairs to his parent's room on the floor below. Someone would lead him back to bed, and he would quietly submit. Another boy was often found pulling out the bureau drawers as though in search of something. We have never observed an accident from sleep walking in childhood; nor have we come in contact with cases of extraordinary feats (walking on roofs or balancing on window ledges, etc.) such as adult somnambulists perform. Sleep walkers are nearly all neurotics. The fact that the child lives so much in the subconscious field of mentality probably

throws some light upon sleep walking, and upon the sleepers res siveness to suggestion and command.

Treatment again involves a careful investigation of every p of the patient's life. All that has been said of nightmare is eq applicable here. He should live much in the open, and shoul some instances be removed from school. Helpful, hopeful sugge may prove of service to him.

THE NERVOUS CHILD

Synonyms.—NEUROTIC CHILDREN; NERVOUSNESS IN CHILDHOOD, ETC.

The term is not a very scientific one, and yet everybody unders what is meant by the term nervousness as applied to infancy, c hood or youth. Many degrees of nervousness are recognized; f Still puts it, "at one end of the scale there is the simple nervo excitable child, at the other end is the child who shows hyst symptoms as severe as any that occur in adults."

Etiology.—The nervous child is a product of civilization far as our knowledge goes, the condition is never observed in sa We desire certain things that civilization values highly—cu knowledge, wealth, position and power. We desire the same t for our children. We pursue these things in the city—the art and crowded mart which man has created to render his quarry near and his quest more certain of success. We work against n and encourage others to work against nature, and nature pays th

Burr contends that all neuroses are inherited, or at least cong He avers that healthy children do not develop such symptoms ' under stress." In the main we agree with him in the first c tion; but on the other hand, we are convinced that children nally healthy may succumb to the stress of bad nutrition, faulty e tion or disease. As a complement to the second conclusion, we ar convinced that children originally nervous may be redeemed th the beneficent influences of good nutrition, proper education an vention of disease.

Bad inheritance may be of many types, all arising throug sins of civilization. The term transforming neuroses is a graphi illuminating term signifying that one neurosis or psychosis may a in an ancestor, a totally different one in a descendant. Neu psychoses and gross nutritional disease in parents (phthsis, starv tissue deterioration from alcohol or other drugs, syphilis, gout

effects of various excesses) are the principal predecessors of neurotic and psychotic children. Certain races, which have attained a high degree of civilization, notably the Jews, are more liable to generate neurotics; while other races, nearer the savage, are rarely responsible for them.

The mother's physical and mental health during pregnancy are matters of considerable moment to the child. We ally ourselves with those who believe that excessive vomiting of pregnancy, loss of weight during the same period, eclampsia, and even mental or physical shocks may affect the nervous system of the child in utero. Again, birth injuries or asphyxia following birth may wreak sufficient damage to the brain to render the child nervous, even though motor evidence of gross cerebral lesions fail to manifest themselves.

In infancy, proper nourishment is needed—needed more imperatively than at any time in life. (See Infant Feeding.) The occurrence of rickets in infancy may determine many nervous conditions, with which we have already dealt. Proper training of the infant, particularly in matters of regularity in sleep, regularity in feeding, wise management of infant crying and sufficient life out of doors for him is a matter of vast moment. In it we have the beginning of habits good or bad. In the main the baby should vegetate, with Dame Nature as the nurse, and the less man interferes with him or her, the better infantile development proceeds. Infectious diseases may mar the nervous system in a number of ways; not only through accompanying meningitis or cerebral hemorrhage, not only through convulsive accompaniments, but also through interference with sensory mechanisms as when eyes or ears are damaged, and through their dire effect upon nutrition. Rheumatism in childhood deserves special mention here, because of its relation to chorea.

Faulty education, both at home and in school, contributes its noteworthy share to the etiology of childhood's neuroses. Parents are at fault in many ways. They are too lenient or too strict, but chiefly they are too remiss in recollection: Did they but delve more frequently into their own memories, delve in a quest for what they themselves thought and did and said when of the same ages as their children, childhood would be accorded better understanding, broader sympathy, and wiser management. School teachers still err in striving to make miniature men and women out of their children. Less mathematics in the early years, more training of observation through nature study, less eye work and more utilization of hearing, better rounded physical development, fewer facts and more interest—these are a few of the

needed reforms that would serve in the securance of fewer dullards and fewer neurotics. Above all education should utilize our heroes and our saints; for the child, a natural hero-worshipper, may so be stimulated to regard repression and virtue, bravery and toil as representing the highest standards of life. Anent of this very hero-worship, teachers and parents are too often judged by their weakest moments: Did they but realize that they themselves should appear as Olympians to their children and pupils!

In frights and in physical injuries, neuroses may again arise or be accentuated. Children, particularly nervous children, should be spared from them.

Let us repeat; most neurotic children have inherited their peculiar nervous temperaments. These are but accentuated by the other causes here mentioned; but even healthy children may become nervous if the stress of life proves too severe for them.

Symptomatology.—In general we may recognize nervous children from their physical, nervous and mental characteristics. Of necessity many of these have been touched upon in our consideration of convulsions, headaches, habit-spasms, chorea, speech disturbances, and sleep disturbances; for in most instances these conditions are more or less closely related to the nervous constitution.

Physically the nervous child is often slender of build and very active in body. Even in babyhood he may be recognized sometimes by his well-nigh incessant crying. He may be of the small-featured phthsical type of the older writers. Very often he has dark half circles under his eyes. Despite his great restlessness he tends to fatigue easily. His appetite is often capricious, and not infrequently he is of a constipated habit. He tends to have high elevations of temperature on relatively slight provocation. Still lays much stress upon his cardiac phenomena: The heart beat becomes very rapid under emotional stress. It also possesses a quick staccato or slapping quality. Mucous colitis is occasionally seen in childhood, as it is in nervous adults.

Nervously, we repeat that he is in almost constant motion during his waking hours. Abnormal movements may also be in evidence such as the various tics. Stuttering and stammering, particularly the former, are probably always pathognomonic. Marked vasomotor phenomena usually accompany the faulty efforts of expression. Granted an attack of rheumatism or of some other infectious disease, true Sydenham's chorea may appear. If an older child becomes hysterical pseudo-paralysis may appear in various portions of his body. Of sensory phenomena, headache is probably the most common. In

version of the color fields, loss of smell, etc., are not commonly seen in children, unless they become hysterical in the later years of the child-life. Nocturnal or diurnal enuresis and the much rarer incontinence of feces are other nervous symptoms of importance. Sleeplessness is common, as we have previously indicated.

Mentally, these children are usually above the average—at least they are so far as ability to learn rapidly is concerned. Indeed they tend to chum with one another at school—a bad thing for them, and to regard more normal children as inferior to the chosen few. But when it comes to application, the nervous child often fails, showing fatigue signs much more quickly than his less brilliant fellows. Thus nervous children are often poor mathematicians. They are unduly impressionable and unduly excitable. Music often affects them profoundly, and they "become wildly excited at children's parties." Ghost stories and other horrible tales often cause them restless nights. Emotionally, they exhibit lack of inhibition most markedly, being unduly sensitive to reproof and punishment, and overjoyed by praise and rewards. They are often timid to a degree, and many of their fears border on the pathologic. Thus we may find fear of reproof, fear of the dark, fear of eternal punishment, fear of being alone, fear of contamination, etc., well-nigh obsessing the child. Night terrors and the rarer day terrors may also be in evidence.

Diagnosis.—Usually this is made without difficulty. Most parents know when their children are nervous, and if they fail to recognize it, relatives and friends are not slow to inform them. By careful observation of his physical, nervous and mental characteristics, the medical attendant should always be able to detect the nervous child.

Prognosis.—This is much more difficult. Indeed, no one knows how far in one direction or in another his nervous organization may carry a given child, *i.e.*, whether he may develop the qualities of a genius or may actually fail under the burdens and vicissitudes of life. That much may be done through wise physical, medical and mental oversight to avoid the latter result, we have already indicated.

Treatment.—Professor Ewald tells us that English thoroughbreds are becoming more and more swift; but that on the other hand, the course of the English Derby has had to be repeatedly shortened. Civilization has produced neurotic children as it has race horses; though the first have resulted incidentally, the second been produced through malice aforethought. To have speed and stamina both would mean a "consummation devoutly to be wished." Let us be truthful: We would not willingly desert all that civilization has conferred upon

us and our children. How then are we to remedy its adventitiou and vicious results? The answer is simple: By getting back to natur Many healthy signs are appearing on the latter-day horizon—signs tha prophesy the betterment of our race. Eugenics is an example. Societ has a right to prevent its tuberculosis, its syphilitic, its mentally def cient, its insane, and its habitual criminal classes from propagatir their kind. Better fed, and better protected from the physical menac of life than ever before, man should proceed to breed strong and tru

Of the management of pregnancy and lactation we have spok in other portions of this book. Both are receiving more attention the present time than ever before; though it is not to civilizatior credit that breeders of domestic animals should have paved our w to knowledge.

Of the care of the human baby, we have also said enough. Let t sanguine motor baby realize from an early age that crying brings hi nothing, unless it result from hunger, thirst, discomfort or actual pai When these causes are responsible for the crying, intelligent manag ment should spell relief, not purposeless handling, jogging or croonin

Of later parental and school education we have also spoken. W trust the student now perceives that the intelligent treatment of th nervous child is indissolubly associated with our understanding of th causes of neuroses. Let it never be forgotten that imitation is or of the most potent forces in education. If parents and teachers coul only see the dolls, and dogs, and cats, who are made to act as schola in the play school, the child performing the teacher's rôle meanwhil how favorably and how unfavorably they would see some of their ow methods faithfully portrayed.

Again we have depicted the dire effects of infectious diseases upc the immature nervous system. Every step in prophylaxis, and eve advance in specific therapy that medicine makes, means not only th saving of more lives, but also the sparing from disaster of more nervou systems.

The nervous child should himself go back to nature. Botanizir in early childhood not only trains his power of observation, but it al carries his body into the open and far afield. Later, swimming, fishin hunting and athletic sports enable him to rehearse the developme of his race in a way that makes for his physical and mental bettermen The child who fails to realize the satisfaction that comes from indulgir in these activities of primitive man, simply loses a portion of h birthright.

Ethically, unwise sympathy may be the worst thing possible for th

nervous child. He must often be removed from his nervous parents, before his regeneration can begin. Burr says "he must be made to see right, and to do it."

Rest treatments are often of more service than drugs; for frequently the nutrition of the neurotic child is far from normal. Nevertheless, drugs are of much service in his successful treatment. Thus, it may be necessary to use bromides or chloralamid to get the baby or the child into good habits of sleep. Hydrotherapy too may prove of service in securing sleep; though one can never predict, in a given case, whether bathing at bedtime will act as a sedative or an excitant. Later on he should learn that restful sleep follows the day's toil and comes with the consciousness of duty well performed. Arsenic is another valuable drug, and so is iron; for these children are often in need of tonic medication. Laxatives may prove of much service, and as we have indicated, the combinations of mineral and vegetable laxatives act best.

RAYNAUD'S DISEASE

Raynaud's disease, called also symmetric gangrene, is a trophoneurosis occurring rarely; but the sufferers are quite as often children as adults. This disease consists of a localized ischemia or asphyxia, symmetrically distributed. The parts affected are pale and waxlike in appearance, greatly increased by variations in temperature, as when dipped into cold water. The local temperature is lowered, and if the part is pricked, little or no blood comes from the puncture. The regions affected are the fingers and toes, the nose, and sometimes the buttocks and calves. The disease may remain slight and the parts recover their tone. In other instances the disorder progresses and gangrene results, producing a destruction more or less extensive.

Causes.—Raynaud states that the cause for the disease is a condition of arterial spasm. This theory is a perfectly possible explanation of the condition, but some underlying cause must be present to bring about the vasomotor difficulty. Other observers believe the phenomena due to an obliterating endarteritis.

The **symptoms** of Raynaud's disease have been noted in connection with neuritis and myelitis, locomotor ataxia, and syringomyelia.

The **prognosis** as to life is fair. If the disease destroys tissue extensively, the general health suffers.

Treatment is mainly the raising of the plane of the patient's health. Galvanism and faradism are used with good results, and nitroglycerin in ascending doses at times is efficacious. A prompt removal of the gangrenous parts is indicated.

CHAPTER XVII

THE SPECIFIC INFECTIOUS DISEASES

TUBERCULOSIS

Tuberculosis is a specific infectious disease due to the presence in the system of the bacillus tuberculosis, discovered by Koch in 1882. It is characterized by the formation of small nodular bodies around an irritated point, the center of which is the tubercle bacillus. The process is the product of a local inflammation, and may be acute or chronic, resulting in specific toxins, causing an irregular febrile movement and the formation of new and easily degenerated tissue, called tubercle, which may become so much further weakened as to be described as caseous. It is met with in nearly all parts of the globe, and is more destructive to human life than any other one disease, "causing about 14 per cent. of all deaths—more than the aggregate from all the commoner infectious diseases, including Asiatic cholera and leprosy." Tuberculosis is now almost universally regarded as contagious, infectious, or both, and prevails not only in man, but in many animals and may be acquired by inheritance, inhalation, swallowing, and by inoculation. The contagion of tuberculosis is of a slow and insidious kind, and there must be a suitable ground for its growth and a fairly large amount of the morbid material for it to grow upon. While to other contagious and infectious disorders there may come an acquired immunity, there is a tendency in tuberculosis, when begun, to steadily and rapidly progress. The presence of the bacillus tuberculosis in whatsoever secretion or tissue of the body is an infallible indication of infection by the disease, and there is practically no limitation to its extension. Infection does not necessarily mean the establishment of a progressive and fatal disease. In many cases a natural and spontaneous cure is effected, when favorable conditions for the development of the disease are not present nor continuously maintained. There may also occur spontaneous arrest, even after the symptoms have declared themselves, the process becoming quiescent under favorable circumstances.

Etiology.—The direct and exciting cause of tuberculosis is the tubercle bacillus of Koch, which gains entrance into the system—(1)

by direct transmission (parental); (2) by inhalations, dried sputum floating in the air, dust being a collateral medium of contagion; (3) through infected milk and meat of tubercular cows and food animals; (4) through kissing, especially where the practice prevails widely between families and friends; (5) through the skin and mucous surfaces of the lips and genito-urinary tract, etc.

Tuberculosis may be congenital. Lehman reports a case in which the tuberculous mother died, three days after the birth of her child, of tuberculous meningitis, the child living but twenty-four hours. In its spleen, lungs, and liver were found nodules resembling tubercles and containing tubercle bacilli in large numbers. Birch-Hirchfield reports a similar case.

Tuberculosis is extremely rare in the new-born and uncommon in the first three months of life, increasing in frequency toward the end of the first and during the second year. It is often met from the third to the fifteenth year. Among children its seat is more commonly in the bronchial glands, lymph-nodes, lungs, and bones and joints; it is also found in the pleura, peritoneum, brain, stomach, intestines, the large viscera, heart, and skin.

Certain individuals among animals and men are more susceptible to tubercular poison than others. This susceptibility may be inherent or acquired. Some races of both animals and men exhibit a marked predisposition to this disease, which among these individuals is propagated with great readiness and develops with extreme virulence. Among races and families in whom there may be no general predisposition there are occasionally seen individuals who are distinctly more receptive or less capable of resisting the infection than others; and since the time of Hippocrates people of a certain type of body, as described by him, are believed to be prone to tuberculous disorders. This is especially true among children in whom classic types of conformation are recognized, as the " tuberculous" with thin skins, long, slender bones, light hair, bright eyes, and oval faces; and the "scrofulous," with chunky figures, dense muddy skins, thick lips, heavy features, and large bones. Certain organic defects seem to render their possessors more susceptible, such as a contracted thorax, with limited respiratory capacity, small and feeble hearts, narrow arteries, and relatively large-sized viscera. Certain local conditions in children are potent predisposing causes, such as catarrhal conditions of the throat and upper air-passages; also, dilatation of the bronchi and existing pleurisy, disease of the stomach and intestines, especially where there is long-standing enterocolitis. Tuberculosis in children is

acilli have been found in the semen of the tuberculous male (Rosen-
erg and Willson). They have also been demonstrated in the blood
f the new-born of tuberculous parentage (Rosenberger). The children
f tuberculous parents most frequently exhibit the disease, but are
hus constantly and intimately exposed to infection. Wherever the
individuals are restricted in the matter of fresh air, sunlight, and
exercise, there is greater prevalence of tuberculosis. Local epidemics
of this disease occur in all communities. In Philadelphia, in certain
wards of the city, it is shown to be particularly prevalent, especially in
previously infected or badly situated houses (Flick). The air exhaled
by tuberculous patients is considered harmless, but a large danger
exists in their sputum, dried and pulverized and scattered about.
It must also be remarked that in the act of coughing, a spray may be
thrown to some distance through the atmosphere. Such spray may
contain numerous tubercle bacilli. They have, for instance, been
found upon the head mirror of the examining laryngologist.

Food is a common but perhaps exaggerated means of tuberculous
infection, especially the milk of tuberculous cows, rendering it absolutely
essential that systematic sanitary inspection of all animal foods should
be rigid and constant. It is not certain whether the milk of a tuberculous
woman is virulent or not. Happily the mere swallowing of tuberculous
milk, cream, butter, or meat is only a relative danger, other conditions
being necessary for infection, local traumatisms, inflammations. etc.
It is possible, however, for the tubercle bacillus to pass through intact
mucous membrane. Certain general conditions strongly influence
infection, especially environment. The disease prevails in crowded
centers, where contact among individuals is more direct, along with
many devitalizing influences, among which severe or prolonged nervous
strains are important, and restricted opportunities for movement and
change. The situation of the house, the common living-rooms, the
soil, cold and dampness, elevation, and the like, are potent factors in
tuberculous propagation or resistance. In infancy infection is dem-
onstrated to be through the respiratory tract, shown by the common
distribution of the primary lesions. Infection through the alimentary
tract is much less certain or frequent. A meat diet was much more
generally used in the latter half of the last century than the first, yet
tuberculosis was far less prevalent in the later period. In both the
respiratory and the gastro-intestinal tract some lesion of the mucous
traces is necessary for the ready acceptance of the poison. Even
the bacillus, when lodged in the adjacent lymph-nodes, may
sometimes remain inert. Treves and Holt maintain that tuberculosis of

the cervical lymph-nodes is rarely a source of further extension of th disease, though Jacobi makes much of the latent danger of spread from this source. Inflammation and acute febrile conditions may certainly stir up this dormant infection and cause wide-spread disease

There is much discussion at the present time concerning the various types of tubercle bacilli—human type, bovine type, swine tubercle bacilli, etc. It has been demonstrated that the human type of bacillus may cause tuberculosis in kine, and the reverse of this has also occurred. It will represent a distinct advance in our knowledge, however, if it shall be proved subsequently, as some now contend, that the bovine type of organism is principally responsible for glandular, joint and bone, meningeal and peritoneal disease in the human subject From the prophylactic standpoint, such an advance in knowledge would prove of most practical value.

General Tuberculosis

Tubercular infection is oftentimes most puzzling in its onset and course, giving a wide variety of symptoms, at first vague and ill defined, and only later, and not then always, showing distinct evidence of localized disease. Each case gives rise to some peculiar feature depending upon the avenue and direction of the infection, the degree of resistance in the tissues, constitutional peculiarities, and the like The general febrile process thus masks the local disturbance, which may escape recognition altogether or be only shown postmortem.

In infants the symptoms are often merely those of a general wasting —a marasmus; the subjects are pale, thin, slowly lose weight, and finally die of exhaustion. As a rule, there will be recognized fever, possibly much higher than suspected when the thermometer used, but seldom regular in course or above 100° or 101° F. (37.7° 38.3° C.). Slight pulmonary signs appear toward the end, not well marked, but discoverable with care; dyspnea and cough may become pronounced later. Again, the symptoms point toward lesions of the digestive tract, vomiting, and diarrhea; and these may be due to the constitutional disturbance rather than local infections of the organs disturbed. The diagnosis in babies under a year old can be made only through the knowledge of a probable tubercular infection, (exposure to older folks who suffer from the malady) inheritance, inference from collateral conditions, infected food, etc., and a careful consideration of symptoms and signs. In a considerable proportion of cases the newer tuberculin tests may serve to confirm our suspicion

These may be described as cutaneous or percutaneous. The subcutaneous test, or diagnostic tuberculin injection, is seldom employed in the last few years, and may prove valueless in febrile cases. The conjunctival or Calmette reaction is also falling into disuse, because of the untoward ocular inflammations that sometimes follow its employment. No such objections can be advanced to the employment of the Moro test (cutaneous) or of the von Pirquet test (percuntaneous). The former is pursued by simply rubbing a prepared ointment of old tuberculin and lanolin (50 per cent.) into the skin of the lower chest or of the abdomen. In 24 hours or more (sometimes several days), the reaction appears. This consists of an erythema at the point of inunction. Most frequently there are seen a number of minute papules. Our own experience is in favor of the employment of this simple test. The von Pirquet test is made by making three vaccinations (scarifications with a specially constructed instrument). The upper and lower scarifications are made through drops of tuberculin. The central or control scarification is made through a drop of inert liquid. (See Illustration.)

FIG. 95.—A POSITIVE VON PIRQUET REACTION IN A TUBERCULOUS SUBJECT. (*Philadelphia General Hospital.*)

In our own experience these tuberculous infants nearly always reveal important physical signs when light percussion is employed over the manubrium anteriorly and superior to the bronchial roots posteriorly. These are "manubrial" and "stripe-dulness." It requires some practice to elicit them. Tileston and certain dermatologists have called attention to an important skin lesion in the miliary tuberculosis of infancy. Numerous macules, about 3 c.c. in diameter, are found, principally where the diaper fits (thighs, buttocks and abdomen). They are surmounted by vesicles or pustules, which dry and leave crusts. When the crust is removed, a crater-like excavation is seen. These lesions often yield tubercle bacilli upon histologic examination. In older children the symptoms are those of a continued fever, with protracted and indefinite symptoms, each one insignificant, but collectively convincing. The subjects are generally feeble, ill developed, hypersensitive, lacking in vigor, and liable to catarrhal or dyspeptic disturbances. Typhoid fever is closely simulated, barring the character-

istic spots and splenic enlargement. Always there are the wasting and cachexia; often there are meningeal symptoms. The history, the systematic examination from top to toe, and the reactions described, will help us over difficult diagnostic places.

Tuberculosis of the Lungs

Next to tuberculous involvement of the bronchial glands, the lungs and bronchi are most commonly affected by tubercular processes, producing pretty much all varieties of pulmonary disease. The subjects to be now considered are those states of tubercular involvement where the most conspicuous disturbances are observed in the lungs, producing the clinical features of an acute or chronic pulmonary disease. Two groups of cases may be separated: the rapidly destructive processes,—acute tuberculous bronchopneumonia, and a slower chronic form, accompanied by ulceration, called chronic pulmonary tuberculosis (phthsis).

Acute Tuberculous Bronchopneumonia

Acute tuberculous bronchopneumonia is common in childr from the sixth month to the fifth year, and is the characteristic a most frequent form of tuberculosis in early life. It is peculiar liable to follow the acute infectious diseases, especially measles a whooping-cough. It is also often a consequence of whatever cond tions, acute or protracted, have profoundly lowered the general healt Inflammatory disturbances about the upper air-passages and acti catarrhal or obstructive troubles seem to predispose markedly to th development of tuberculosis, and it may be the terminal process i persons affected by local tuberculous trouble elsewhere. The pleu is frequently involved also, though more frequently with milia tubercles or fibrous adhesions than with the tuberculous manifestatio of later childhood and of adult life (serous pleuritis and empyema Both lungs are involved, as a rule, in different degrees. The upp lobe of the lung is oftener affected than the lower, and especially th part near the root, in the region of the bronchial glands.

Morbid Anatomy.—The essential lesion at first is bronchiti The tubercle bacilli, lodged in the terminal bronchioles, excite a pr liferation of the fixed cells, accompanied by the production of epith lioid and giant cells, which frequently contain the bacilli. This epith lioid element acts as an irritant, becomes surrounded by leukocyte

chiefly polynuclear, forming a translucent gray mass, the tubercle of Laennec. At the margin of the tubercle a network of fibers is formed from the connective-tissue matrix. The tubercle undergoes changes which are in the nature of caseation and necrosis, with the presence of the specific bacilli and others (Prudden), as the streptococcus and straphylococcus.

The bacilli tend to excite a coagulation-necrosis, beginning in the center of the tubercle and spreading to the periphery, convert the tubercle into the yellow, cheesy mass so common in tuberculosis. At this stage the mass may undergo—(1) softening, (2) encapsulation, (3) calcification, or (4) sclerosis. The younger the subject and the more acute the process, the less tendency is there toward the spontaneous healing processes of encapsulation, sclerosis and calcification. In the first, the softened mass may break into a bronchial tube and become expectorated, leaving behind an excavation with ulcerating surfaces; or, (2) being encapsulated by the overgrowth of connective tissue, undergo (3) calcification, or (4) necrosis with increased growth of fibrous elements, ultimately ending in the conversion of the tubercle to a hard, firm structure. In some instances a simple bronchopneumonia precedes the tuberculosis; especially is this true where the disturbance follows upon measles, whooping-cough, or other infectious diseases.

"In cases of tuberculosis consecutive to bronchial pneumonia, we find the lesions of two sorts: Simple inflammatory non-tuberculous, such as peribronchial suppuration, dilatation of the bronchi, lesions of the alveolar epithelium, and peribronchial and perialveolar sclerosis; then, in addition, there are the true tubercular processes, peribronchial nodules, tubercular infiltration, and caseous areas" (Mosny, quoted by Osler).

Again, sometimes the tuberculosis is established before the bronchial pneumonia sets in, especially where tuberculosis is latent in the individual, and a bronchial pneumonia arises from some other cause. "This is," again to quote from Mosny, "a bronchopneumonia dependent upon pneumococci or streptococci, invading the lung already the seat of local tuberculosis." Once the process of softening is established in children, it usually progresses until the life of the patient ceases. The bronchial lymph-nodes in such cases will be found tuberculous, and a chain of these may be seen to lie along the greater bronchi. Periods of arrest occur, with subsidence of the physical signs, cell-organization proceeding to produce fibrous walls, acting as barriers to the advancing process.

Symptoms.—There is little or nothing in the earlier stages tubercular bronchopneumonia to distinguish it from the simple fo the physical signs are the same. The disturbances of the apex, tho usually predominating, are not of absolute diagnostic importa because in children the tubercular process may begin at the b or center, and the closest examination of the lungs may reveal li or nothing characteristic. The most valuable indication of special nature of the trouble is in the course and progress of the dise which exhibits great irregularity in the temperature-range and mar evidences of rapid loss of strength. All this is far more significan a little child than in an older person, in whom several factors coml to form such a picture. Emaciation soon becomes conspicu sweats, oftentimes profuse, accompany, and the gravity of the diso becomes obvious from many things, producing a suggestive syndro Cough may or may not be present.

In protracted tubercular bronchopneumonia the signs of c solidation manifest themselves, involving, it may be, the whole l This proceeds to caseation, softening, and cavity formation. In acute cases the duration is about a month. It is rarely possibl children under seven to secure expectorated matter in which to hibit the bacilli; and yet it is a constant matter for suprise how exter tubercular disease may be present with little or nothing in the phy signs to evidence the fact. It has been our habit, for some tim swab out the pharynx of the infant or young child with suspe tuberculosis, and to make a smear upon a microscopic slide. may be stained and studied directly. The method may fail us v no lesions have broken down in the lungs, bronchi or glands; but always worth pursuing. Studies may also be made of the stools ar the blood (Rosenberger). Once again the tuberculin tests menti may furnish contributory evidence. Cavities can rarely be der strated, though small ones having ragged or irregular walls comm exist. Skiagraphic studies may reveal the enlarged tracheo-bron glands.

Chronic Pulmonary Tuberculosis

In very young children tuberculosis shows itself in the lungs wide-spread generalized process, involving other organs as well, or bronchopneumonia. In older children of seven or eight or mo resembles the chronic tuberculosis of adults. The lesions in chil are much the same as those in adults—miliary tubercles, peribron nodules, caseous masses, areas of softening and of fibroid thicke

and cavities of various sizes. The parts attacked first are not necessarily near the apex, as in adults, but may be at the base or center. The disease spreads directly from the deeply seated glands, either in the lung itself or along the trachea and about the bronchi. Occasionally considerable areas of caseous pneumonia are found; small cavities are often met, but large ones very rarely. A tuberculous bronchopneumonia frequently gives origin, through the disturbance of the smaller bronchioles, to a peribronchial alveolitis. There are also seen caseous masses, gray tubercles, infiltrations, dense fibroid thickenings, and irregular cavities near the roots of the lungs; one or both bases become semisolid from caseating pneumonia, or similar states arise at the apex. The pleura are likewise affected, producing empyema, etc. The liver, kidneys, and spleen exhibit caseous masses, as do also the mesenteric glands, and ulcerations form in the intestines. Tubercles are found in the peritoneum and meninges of the brain.

Symptoms.—As in the adult, the general features of oncoming pulmonary tuberculosis in a child are those of marked pallor, gastric disturbance, loss of flesh, and steadily failing health. Along with this is loss of appetite, rarely extreme. Slight chilliness may indicate fever, and malaria or typhoid fever may be suspected. Some cases follow upon recurring bronchitis along with nasopharyngeal catarrh. There is nearly always a hacking cough, at first dry and short, by and by looser, usually in the morning, sometimes with more or less sputum, occurring during the day or at night, and occasionally paroxysmal, like whooping-cough. Young children do not expectorate; yet if over eight or ten years of age they may do so, and the sputum is merely mucoid at first, and in the later stages it becomes purulent. Hemoptysis is rare in children. Fever is always recognizable; this, along with progressive feebleness, acceleration of pulse, and a slight, regularly recurring cough, should always excite solicitude. The fever itself in the earlier stages is remittent, ranging between 100° and 101° F. and a morning subnormal period. When the disease grows more extensive, the temperature has the quality of becoming hectic—in the morning normal or subnormal, while in the evening it may reach 104° or 105° F. (40° to 40.5° C.). It represents the occurrence of mixed (pyogenococcic) infection. Chills are rare, but toward the close profuse sweats are common. Difficulty of breathing may be present from the first, due in part to the fever or to extensive bronchitis. In other cases, as in grown people, there may be little or no dyspnea and yet a wide-spread destruction of the lung tissue exist. Tenderness on percussion over the affected areas is often observed in children. The digestive organs are frequently

involved, and not seldom a persistent diarrhea indicates tuberculous intestinal ulceration. Albuminuria is more or less common in the later stages. General anasarca in a child should suggest among other possibilities the presence of tubercular complications involving the internal organs.

Physical Signs. *Inspection.*—The chest is usually long and flat; the affected side may show limited movements, with prominence of the clavicle, or in chronic cases flattening with depression of the shoulder. On *palpation* there may be discovered limited expansion and increased vocal fremitus. An excellent way to detect the lessened apical expansion is by standing behind the patient and placing the finger tips lightly over his clavicles. Expansion is not only less upon the affected side but it is also delayed (Anders). *Percussion.*—There is little or no change in the percussion-note in the earlier conditions except, perhaps, if one apex is considerably involved; then there is dullness above and below the clavicle; supraspinous fossal flatness is often hard to detect. The cracked-pot sound is of no value in children. *Auscultation* may exhibit the various sounds of bronchial catarrh, alteration in respiratory sounds, and rales, moist and piping. In our experience, the most common early phenomenon is weak breathing with occasional crackling rale. The important situations to search for this are the supraclavicular fossa, the apex of the axilla and the supraspinous region. Later, the expiratory sound becomes prolonged and harshened. In children the course of chronic tuberculosis of the lungs is much more rapid than in adults, and they rarely survive longer than a year. Occasional phases of improvement may be seen, along with periods of high fever and rapid loss of strength. In rare instances chronic tubercular changes merge into fibroid conditions, and a fair measure of health may be regained, enabling the child to live a number of years. Club-fingers are exhibited under these conditions, a sign merely of chronic degenerative change, though they are far more likely to occur when pulmonary abscess is present. Suspicion of tuberculosis should always be aroused whenever progressive emaciation takes place in a child with cough and hectic fever. Tuberculous bronchopneumonia is the condition found early, but the progressive character of the lesion may often be traced. Every effort should be made to secure some portion of sputum, which will help to clear up the diagnosis. True recovery from tuberculous states in children is comparatively rare once hectic fever is established. Tuberculosis may attack the pleura usually secondarily to existing disease in the lung. The pericardium is also occasionally involved; this is usually associated with tuberculosis

of the mediastinal and bronchial glands. The kidneys and intestines also are not seldom found infected, producing albuminuria and disorders of digestion, persistent and recurrent.

Diagnosis.—Hectic fever, dry cough, persistent catarrh of the respiratory tract, diarrhea, emaciation, and evidences of consolidation are probable signs of chronic tuberculosis of the lungs. The discovery of bacilli in the sputum is the only positive diagnostic sign of the disease. Trudeau condemns the waiting for marked physical signs or a clinical picture, and urges the use of the tuberculin test, which he declares, is the most searching and delicate means of detecting early tubercular disease. It is not dangerous in incipient cases, and no harm results from small graded doses at two or three varying intervals. As we have mentioned, however, the later reactions are superseding the injection test.

Prognosis.—The ultimate outlook is distinctly unfavorable, though the disease is not incurable. A family history of consumption adds much to the gravity of the outlook, showing a lessened power of resistance to the toxins. When cases are seen early and placed under proper treatment, recovery may take place. Prognosis is bad when hectic is established, appetite poor, and the stomach of defective competency.

Treatment. *Preventive.*—Knowing that tuberculosis is an infectious disease and that children are exceedingly susceptible, prophylactic measures should be instituted, and their observance insisted on both by the patients and by the members of the household. The consumptive adult who comes in contact with children should not spit promiscuously about the house, or in the cars or public conveyances. Sputa of consumptives should be received in suitable vessels, containing antiseptic solutions, and afterward destroyed. Pieces of linen can be used for this purpose and subsequently burned; but much better are the cheap and useful sputum cups or boxes. The healthy should not sleep in rooms occupied by those suffering from this malady. Kissing is to be positively prohibited. Cattle should be rigidly inspected, and all meat and milk of tubercular cows declared unmarketable. A consumptive mother should not nurse her child.

In dealing with tubercular conditions, prevention is much the most important part of treatment; but this involves not only preventing the sources of contamination reaching the individuals, which is to be done by zealously guarding them from all sources of infection, but whenever tubercular glands are recognized, these should be given carefully dosed X-ray treatment by a competent roentgenologist.

We have repeatedly seen them disappear without scarring when s treated. One of us, following the methods of Trudeau, has also bee securing remarkable results with tuberculin. He has started wit small doses of old tuberculin (1 ten thousandth of a milligram), ha given his injections bi-weekly and has doubled the previous dose a each injection. He has never seen a tuberculin febrile reaction fro such treatment. If several glands become involved, however, an suppuration is impending, thorough surgical intervention is to be ad vised. In children so predisposed the utmost pains should be taken t rear them hygienically, and particularly to guard against and cure a catarrhal affections. If a tissue *minores resistentiæ* can be remov (such as adenoids and enlarged tonsils) such removal should not postponed. Carious teeth should also receive careful attentic The children should be especially encouraged to take and assi late fat and protein in their diet, and should be guarded during c valescence from contagious diseases.

The treatment of all varieties of tuberculosis in man resolves its into one plain proposition, and that is the maintenance of nutrit vigor. Along with this is the whole question of the powers of re tance or immunity which may be natural or acquired. Whate makes for resisting power makes for recovery. The modern succes treatment of tuberculosis may be outlined as follows: 1. Open existence. 2. Over-feeding. 3. Rest, or more broadly a proper adj ment between exercise and rest. These words may be truly designa as the text of a hopeful, helpful gospel. All who are not hide-bound tradition accept them now; most intelligent physicians preach th a small van-guard of high priests not only preach but also take pain see that their teaching is carried out. Drugs are valuable at tin but should be considered wholly secondary to this great tripod u which success may stand. Open air existence must be a continu life in the open to be most efficacious. It can always be secu Mountain air is probably best; air of bright sunny days is prob better than night air; but any outside air is better than the air of doors. Many ingenious tents, houses, window devices to protect f high winds and intense cold, have emerged from the present ac campaign against the white-plague. Raw cow's milk from a so beyond reproach (vide supra) and fresh raw eggs are the sheet anch of our over-feeding methods. The raw eggs shaken with sweete orange or lemon juice may well be given to children. We give from 2 eggs a day according to the age of the child. Continuous rest in the o should be obtained whenever fever is present. As it subsides, exer

is gradually dosed out to the patient. It is better, however, throughout the course of treatment to secure two periods of daily rest of at least one hour each.

It is an exceedingly nice point to choose a suitable climate for the sufferers from the more active forms of tuberculosis, and while the more distant resorts difficult of access enjoy the most classic reputations, nevertheless there are places comparatively near by each one's home where the local conditions are all that are actually needed, provided great care is exercised in the selection of the house site. For instance, there are to be found near most of our cities sheltered valleys, especially upon hillsides looking to the south, surrounded preferably or fringed by evergreens, ideal sites for cottages and bungalows. The building of a little cabin here will oftentimes afford very nearly all the advantages to be had in remote and well-known health resorts, with few of their disadvantages. It is not necessary, nor is it even desirable, for children to be dragged to the ends of the earth, at great expense and infinite trouble and sacrifices on the part of their parents, when all the essential conditions can be partly found and partly provided at small expense and under intelligent guidance somewhere near their homes. The one thing most essential to those predisposed to tuberculosis is a life in the open air during twenty-four hours out of the twenty-four. The needful conditions can be found in an acre or less of ground through which they can range and play at will. In suitable weather they may venture further abroad and thus enjoy a needful variety. The treatment of more acute tubercular conditions, as where fever has set in, can be accomplished far better within easy reach of home than in the more remote health resorts.

The fever itself is most obstinate and serious. Local cold, as by sponging, is the best means of reducing this, as it serves the additional purpose of acting as a powerful vasomotor tonic.

Drugs may be useful in reinforcing the powers of resistance for the patient by regulating and maintaining the activities of the various bodily organs; strychnin is a most valuable remedy. Digitalis is a useful remedy in the treatment of tuberculosis, but it should be used only when there is positive indication for it. Incompetence in the circulatory system, whether in the blood-vessels or in the heart, calls for digitalis or some of its derivatives.

The diffusible stimulants are of great efficacy in emergencies, such as depressed states of the nervous system or circulation; but alcohol should never be employed continuously.

Of the drugs which aid immunity directly, iodin is rated the highest by some. Flick prefers europhen and olive oil by inunction, and claims that iodin used in this way is practically a specific in early phthisis. To aid glandular activities the mercury salts are of much utility. In states of biliousness a well-directed dose of calomel, ipecac, and rhubarb will help back upon a plane of vigor what seem oftentimes alarming conditions of depression, physical and mental. For hemoptysis nitroglycerin is the main reliance. Rest is imposed, and ice is used locally. Artificial digestants and mineral acids also play useful rôles.

It is a happy circumstance that this most wide-spread and prevalent disease is sometimes spontaneously, and oftentimes entirely, to be checked by suitable measures adapted to each case. Lastly, there is a series of nutrient tonics which have enjoyed the confidence of medical men since the earliest ages, at the head of which list stands cod-liver oil, to be taken one-half to three-quarters of an hour after meals, or when and how proves best suited to the stomach.

Specific treatment for the tubercular process has not heretofore been crowned with any very remarkable success. The brilliant possibilities of Koch's tuberculin have not been realized, but hope along these lines should not be abandoned. Trudeau in this country, and many authorities abroad are using tuberculin with signal success. In speaking of tuberculous glands this important matter has already been mentioned. The reader is referred to the writings of Trudeau for futher information upon this important subject. Internally, creasote and its derivative guaiacol, now enjoy the confidence of the medical faculty. From its use excellent results have been obtained.

The influence of creasote seems to be that of a general nutritive stimulant, lessening the fever, promoting tissue elaboration and digestive vigor, and in other ways, not clearly shown, producing favorable results. It seems in some way to combat the toxins of mixed infection in which pus-producing germs take part, and which constitute perhaps the most serious condition into which a tuberculous patient can fall. This is manifested by chills, fever, sweats, distressing cough and profuse expectoration. Creasote in large, well-sustained doses will greatly reduce suffering and aid recovery. The dose for a young child is from 1/2 to one minim, steadily increased to as much as it will bear, the index of endurance being the tolerance of the stomach. A convenient method is to put creasote in capsules or pearls, which children can readily be taught to swallow, or mix it with some simple elixir, which the very agreeable fluid preparations of pepsin and pancreat

now on the market serve as excellent menstrua.[1] It is usefully administered in the form of an inhalation. Guaiacol is well tolerated dropped on a lump of sugar or into an elixir. None of these highly volatile substances should be made up in a mixture of a perishable nature and allowed to stand. They are better dropped into the menstruum immediately before using. Hypodermically, guaiacol is used along with sterilized olive oil in a 5 per cent. solution. Other balsamic substances have been used by various authorities with good effect.

Among the mixed infections the most serious are the pus-producing germs, with the phenomena of fever, sweats, and distressing cough. For this the great remedy is creasote, in full increasing systematic doses. For hectic and sweating, astringents to the skin—aromatic vinegar or aromatic sulphuric acid is useful applied upon the surface. Internally this last may be given along with nux vomica. Picrotoxin checks sweating admirably in small doses, gradually increased; so does the hydrobromate of hyoscin. Agaricin and zinc oxid in pill form have been highly recommended to check sweating.

Tubercular diarrhea is a serious symptom, requiring the prompt use of astringents, as lead, tannin, gallic acid, sulphuric acid, and the like. Various aids to digestion are usually indicated, the mineral acids, the vegetable bitters, pepsin, pancreatin, caroid, or the compound nucleins; the syrup of phospho-albumin is of great value.

SYPHILIS

Syphilis is an infectious disease of a more or less chronic nature, and belongs to the granulomata. It is caused by the treponema pallidum (spirochetæ pallida of Schaudinn), a spirillum. It may be acquired by inoculation, as in the adult (acquired syphilis) or by transmission from parents (hereditary syphilis). Hereditary syphilis, whether appearing at birth (congenital) or after a short lapse of time, differs essentially from the acquired disease. There is no chancre, and there is no definite secondary stage; but the lesions are both secondary and tertiary from the first. At a later period only tertiary lesions are manifested.

Syphilis arising in infancy may, however, be acquired possibly

[1] Flick states that the best way to administer creasote is in large drafts of hot water some time before meals. For children who refuse this highly aromatic offensive substance there are combinations almost tasteless which have served us well, as benzosol, etc. The beneficial effect of creasote may be due (1) to a bactericidal effect of creasote against the bacilli which are associated with the tubercle bacillus—streptococci, pneumobacilli, etc.; (2) stimulation of the metabolism, which increases and strengthens phagocytosis; (3) a chemic effect of the phenol group, which leads to a neutralization of the toxins. The chemic action of creasote increases with the quantity. Creasote is to be used only in noncachectic tuberculous patients, in the first and second stages (Savoire).

from a sore on the genital tract of the mother, from lesions in the nur or attendant, especially a mucous patch upon the mouth or lip The number of ways in which accidental inoculation or infection of th innocent (syphilis insontium) is legion. It is relatively very rare fo an older child to acquire the disease in venery.

Etiology.—There seems to be quite indisputable evidence tha the cause of syphilis has been identified. The organisms originall described by Schaudinn as the spirochetæ; but now known as th treponema pallidum, require an expert to find and recognize them i tissues. They have been found in primary, secondary and even in te tiary lesions. They disappear from tissues during mercurial treatmen They have been found very constantly in the subjects of hereditar syphilis, and have been recovered from nearly every tissue of the bod Koch has succeeded in inoculating the higher apes, even from tertiar lesions; but the treponema pallidum has not as yet been obtained i pure culture, so that the bacteriologic proof is incomplete.[1]

Syphilis may be acquired from the father or mother, or from bot infecting through the spermatozoa of the male or the ovum of t female. It is generally admitted that if infection arises from a doul syphilization, from both an infected father and mother, the result more disastrous to the offspring. There is the greatest danger fr paternal transmission during the first year after primary infection, a it is possible up to the end of the fourth year. Early and thorou treatment greatly lessens the probability of transmission. A mot may bring forth a syphilitic child without herself giving evidence having acquired the disease. Colles' law, well established, is tha mother bringing forth a syphilitic child cannot acquire the dise from the infant, and, further, she is immune to syphilis from a source. It is also well established that the syphilitic mother may nu her apparently healthy offspring without danger of the latter acquir syphilis from her (Profeta's law).[2] If a mother is suffering from c stitutional syphilis, the disease is transmitted in an unusually act form to her offspring. The degree of severity depends upon the st of syphilization, character of the disease, and the nature of the tre ment employed.

Symptoms. *Early Manifestations.*—(1) Those cases which manif the disease at birth or very early after birth; (2) those which develo one or two months later.

[1] This has been achieved since we went to press.

[2] The Wassermann reaction studies have led to some modification of our concepti of Colles' and Profeta's law. The mother really has syphilis in a latent form and g a positive Wassermann reaction. If the child, a subject of Profeta's law, is cured salvarsan, he can contract syphilis. Exceptions to Profeta's law are known.

1. When the disease manifests itself early after birth, the attack will be severer; in other words, the earlier the attack, the graver the disease. The usual symptom-group is emaciation, a severe form of coryza, and an eruption of blebs, particularly upon the palms of the hands and soles of the feet. Certain fissures (rhagades) and ulcerations appear on the lips, and anus which are characteristic and are a source of infection to wet-nurses. There are also signs of bony and visceral disease, disturbances of nutrition, with consequent atrophy of all the structures of the body, and the infant presents the countenance of an old man. All this is due to the direct influence of the syphilitic virus. Skin eruptions are similar to those appearing late in the course of the disease. The liver and spleen are almost invariably affected, and the brain is sometimes involved. These children rarely survive long.

2. When a syphilitic babe is born seemingly healthy, without any sign of abnormality, it thrives well, or apparently so, and may remain thus for a month or two, when a nasopharyngeal catarrh usually develops, producing the characteristic snuffles and interfering seriously with the act of nursing. This catarrhal condition may extend to the Eustachian tubes or middle ear and cause otitis media. In the graver forms of syphilis the discharge may be seropurulent, evidencing ulceration; necrotic changes take place in the bones, with local loss of tissue, producing the characteristic flat nose of congenital syphilis. This is not usual in infancy, the cartilages and bones of the nose are more liable to involvement in later childhood. The protoplasm of children reacts readily to irritative processes, and the syphilitic poison produces extensive changes and ravages in the tissue; hence, the very remotest parts are affected and with a wide variety of phenomena. The skin-lesions develop along with or soon after those of the mucous membranes. One of the earliest is the eruption of small, round, or oval pink macules, disappearing on pressure and occurring upon the lower part of the abdomen or nates, spreading thence over most of the body. The color of the erythematous rash has a tendency to become like that of copper, and yet the resemblance to a simple erythema is very close. Usually there is little or no scaliness, except at times on the hands or feet; at others this eruption tends to grow worse, showing moist, infiltrated patches, closely resembling eczema.

A papular syphiloderm usually accompanies the erythema, in the shape of small, dull, red papules running together. When lesions occur near the mucous orifices, especially about the anus and commissures of the lips, condylomata may result and are highly contagious. There may also form rhagades or linear scars radiating from the mucous

junctures (rhagades oris et ani). Pustular syphiloderms may begi
early as the eighth week, but usually later. The pustules may be la
numerous, and deep, or few and small, varying with the severity of
case. The sites selected are the face and buttocks, the lesions re
bling impetigo or pustular eczema. The syphilitic pustules or c
are dark, thick, and greenish, forming deeper ulcerations than impe
and the itching of eczema is usually absent. It is a great mist
however, to suppose that syphilodermata never itch. Occasiona
furunculoid eruption occurs, especially in ill-nourished children,
lesions beginning as small nodules in the corium, increasing great
size, throwing off irregular sloughs, and leaving unhealthy ca
and resulting in cicatrices. Bullous eruptions are seen occasional
syphilitic children (pemphigus), the skin showing at first a violac
patch; soon after vesicles appear, becoming confluent, running toge
and growing larger. Tubercular syphilides, followed by scarring
also appear.

The viscera are apt to be more extensively involved in conge
than in acquired syphilis. The lesions are less likely to be gumm
than interstitial, the hyperplasia being more or less diffuse.
interstitial connective tissue in the process of overgrowth and
sequent contraction shrinks the parenchyma. The lung, or a po
of a lobe, may present a profuse fibroid infiltration. The sple
usually more or less enlarged, and the capsule is thickened.
liver not seldom is enlarged and hardened, from a profuse scle
an interstitial orchitis may affect one or both testicles, produci
hardening and enlargement of the glands. General nephritis
occasional intercurrence. There are two principal ways in w
syphilis affects the bones in early life, usually the long bones—th
producing changes at the junction of the shaft (diaphysis), the
attacking the periosteum. Osteochondritis, a purely sypl
affection, is an inflammatory process occurring at the juncture o
epiphysis with the diaphysis, checking the normal growth of the b
and thus producing deformity. Its most frequent period of ince
is in the first two months of life. It is usually symmetric, affe
we will say both humeri or both femora above the elbows or k
Periosteitis is more likely to occur after the child has begun to
Syphilitic dactylitis is often seen in young children, the phalange
the metacarpal and metatarsal bones being enlarged to several
their natural size. These may break down and form absc
Syphilitic onychia is not so common. Craniotabes, a thinni
areas of the cranial bones, is often present. In syphilis it espe

affects the occipital bones. In proportion to the severity of the syphilitic poison is nutrition disturbed; in all cases it is much impaired. In the infant the typical appearance is that of a weazened, pallid old man. Such cases are likely to die. Oftentimes nutritional failure is more gradual, due to specific disturbance in the organs of digestion or mere cachectic feebleness. (See Fig. 96.) The blood always shows evidences of more or less anemia; being deficient in red corpuscles. This anemia is of the utmost gravity and significance, and may alone, and directly, cause death. The Wasserman serum reaction is a useful test; but its performance involves an expert and difficult technic. In hereditary syphilis unaccompanied by rachitis, the deciduous teeth are not tardy in appearance. It must be said, however, that syphilis does in some way favor the occurrence of rickets, and of severe forms of rickets. When the two diseases are thus associated dentition may be delayed. In syphilis, there are no characteristic modifications of the first dentition. The teeth may decay very soon, and sometimes the crown is very imperfectly formed, several small tubercles of a molar surmounting a low crown. There is usually slight involvement of the nervous system in infantile syphilis, the nerve centers escaping rather remarkably. Apparent paralyses, often accompanied by tenderness of the joints, are occasionally seen, but these pseudo-pareses readily succumb to specific treatment, and almost never persist (pseudo-paralyses of Parrot). This syphilitic false palsy is an acute epiphysitis, and may be one of the symptoms or the first one of the disease.

Late Manifestations.—Children with congenital syphilis sometimes fail to give early evidence of the infection, or the ordinary symptoms as seen in infancy escape attention. Later, however, characteristic lesions appear (syphilis heredetàire retardique of Fournier), or the disorders become manifest in certain developmental defects involving the teeth, eyes, ears, the bones, the genitalia, etc. Some of these may be parasyphilitic phenomena. We are not prepared to accept the diagnosis of tardy syphilis, however, but believe that in most of these cases the early slight symptoms and signs escape attention. In those instances, too, where the disease has been recognized and placed under proper treatment and the symptoms have disappeared, the little one may fail to develop like other children, or late symptoms may appear despite the early and insufficient treatment. Growth is slow and inadequate, and there are facial and cranial characteristics which often render the disease recognizable at a glance. A young man or

FIG. 96.—THE FIVE-YEAR-OLD CHILD OF A PROSTITUTE. He exhibits the ext malnutrition and paraplegia of congenital lues. He has never walked.—(*The Philade General Hospital.*)

e neither bigger nor look older than a boy or girl of ten
he organs of generation particularly suffer, but the
are stunted in growth, and the vitality of such sufferers
characteristic face is familiar to all medical students:
kin, prominent forehead, asymmetric skull, the depressed
ose, prominent lips with striated lines running from the
mouth, the peg-shaped central incisor teeth, notched in
e eyelids inflamed at the edges, spotted or hazed with
ie cornea—this is a picture familiar in all clinics. Late
yphilis are liable to obtrude themselves at two periods—
ond dentition and at puberty. The most graphic feature
ity described by Mr. Hutchinson, affecting the central
eeth of the permanent teeth, the significance of which is
ognomonic. (The Hutchinsonian teeth are occasionally
ien there is no suspicion of syphilis.) This consists in the
tral cusp, causing a cupping or "crescenting" of the cut-
also a narrowing at this edge, the base of the tooth being
tooth is usually described as "peg-shaped." The cause
to be a defective growth within the alveolus or early in-
itis or alveolar periosteitis. Another characteristic type
il incisor is the so-called "screw driver" tooth—a term so
description seems superrogatory. Syphilis affects the
ber of other ways, but none is pathognomonic and all
other conditions. There may also be a change in the
ilate, which usually has a very high arch, and ulcerative
lace here and in the nasopharynx which result in shrink-
deformity. Large, indolent, mucous patches may occur
and tongue, continuing out upon the lips and cheeks, es-
corners of the mouth, leaving long, striated scars. One
iest and most important changes is due to a periosteitis
ous long bones, with thickening upon the surface of the
; changes in its form. These are occasionally unilateral,
y symmetric and attended with little discomfort aside
il nocturnal pains. The nasal bones may be affected to
i of the bony arch of the nose, and the result in the well-
ed bridge deformity (saddle-back nose). (See Fig. 97
About the time of puberty, or mayhap earlier, the eye is
culiar form of inflammation, an interstitial keratitis,
city of the cornea without much disturbance of the con-
ş with this may coexist an iritis of an indolent kind, yet
ere pain and sensitiveness to light seen in other forms of

mation of the iris. The corneal opacity may obscure this, as well er deeper-seated troubles, as choroiditis and retinitis. The ear ject to inflammatory affections from which rapid deafness some- results in spite of all treatment. Visceral disturbances occur, and the spleen and the liver may become enlarged, alone or together. mber of changes take place in the genital organs; in younger ren the testicles are sometimes enlarged, accompanied by hydro- and this may involve both the epididymis and the cord and work uctive changes. Frequently the only evidence of syphilis in years is mere arrest and perversion of development; the testicles be very small and inefficient and in girls the mammary organs f development and menstruation is liable to be delayed and inade- e; not seldom such cases develop epilepsy.

aneway calls attention to an occasional febrile condition due to ilis, which is readily confounded with acute tuberculosis and may e death. We have seen several instances of syphilitic fever, and seen some remarkable clearings of both diagnosis and disease n therapeutic tests have been applied.

Diagnosis.—The diagnosis of syphilis is not so difficult where esions are well marked and characteristic, or if there is a reasonably st or clear history to be obtained, or if there is an opportunity to y the case with sufficient deliberation. Marks of the disease upon arents are rarely obtained. A history of causeless abortion in the ier is suggestive, but requires thorough sifting. This is said to r usually at or about the sixth month of gestation. The appear- of the child before the disease shows itself clearly may tell little, but nost characteristic features are those of impaired nutrition, gener- without digestive disturbance, and a loss in the normal appearance e skin, its normal freshness, acquiring a shriveled look, with pallor yellowness, like coffee mixed with milk. This is especially seen ie face, though it extends to the rest of the body. A persistent za, however slight, should be viewed with suspicion. Mucous hes can generally be found, commonly about the anus, scrotum, ilicus, in the axilla, mouth, and ears; but in children these may ar over almost any part of the surface. The mucous patches are e to become the seat of an ulcerative process, especially the mouth throat. Epiphysitis, particularly if symmetric, furnishes indubi- evidence of syphilis. If no other symptom or sign accompanies e invariably find enlargement of the liver.

The following points of distinction between syphilitic and scrofulous ns of the skin have been given by Dr. P. A. Morrow:

"1. Syphilitic lesions are general in their distribution; they occur upon any region of the body. Scrofulous lesions are limited in their localization; they have a special predilection fo neck or regions rich in lymphatic glands.

"2. Syphilitic lesions are ambulatory and changing; they disa and reappear elsewhere. Scrofulous lesions are fixed and perma

"3. The color of syphilitic lesions is reddish-brown, or 'lean-ham The color of scrofulous lesions is brighter and more violaceous i

"4. Syphilis is distinct from scrofula in its objective appe

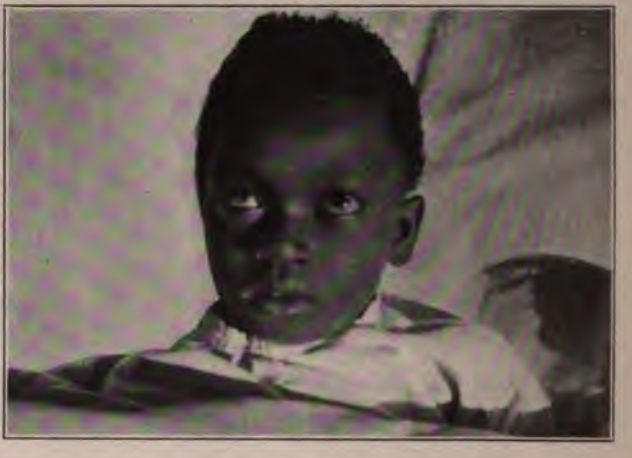


FIG. 98.—INHERITED SYPHILIS. LEUCOMATA FOLLOWING CORNEAL ULCERA (*Philadelphia Polyclinic Hospital.*)

and mode of evolution. In the initial stage the syphilitic neo are firm and hard; the scrofulous infiltrations are softer and compressible. In the ulcerative stages the differences are mor nounced: the ulcers of syphilis are cleaner cut, regular in contou perpendicular, firmly infiltrated border encircled by a pign areola. Scrofulous ulcers are irregular, with soft, undermined b they are painless, bleed easily, and show slight tendency to s

"5. The crusts of syphilis are bulkier, thicker, with a te to accumulate in layers, and darker in color; the cicatrices are s and remain long surrounded by a pigmented areola. The cr scrofula are softer, more adherent; the cicatrices are elevated, irr bridled; they retain their violaceous color for a long time.

"6. The course of a syphilitic ulcer, though sluggish and c is much more rapid than that of scrofula.

"7. Absence of pain and local reaction characterize both syphili scrofulous ulcers; they are essentially lesions without sensory symp

In connection with the bony lesions it is important to diagnose between syphilis and tubercular and rachitic affections. The following points in diagnosis between syphilis and tuberculosis of the bones are given by Dr. Morrow:

"1. Syphilis exhibits a marked predilection for the long bones; its habitual localization is in the diaphysis, and almost always at its terminal extremity. Tuberculosis is almost exclusively situated in the epiphysis, rarely affecting the shaft.

"2. In syphilis there is a marked enlargement of the bone by more or less voluminous osseous tumors or hyperostoses, with little or no involvement of the soft parts; and in tuberculosis the tumefaction is due less to increase in the size of the bone than to edematous infiltration of the soft structures.

"3 In syphilis there is little tendency to suppuration and necrosis; in tuberculosis the pyogenic tendency is marked.

"4. In syphilis osteocopic pains with tendency to nocturnal exacerbation are pronounced features; in tuberculosis the pain is dull and heavy, not aggravated at night; sometimes there is entire absence of acute painful symptoms.

"5. The osseous lesions of syphilis rarely react upon the general system, while those of tuberculosis often determine a marked impairment of the general health, grave complications, hectic fever, cachexia, etc."

In syphilitic dactylitis there is little involvement of the soft parts, the swelling being caused by the enlargement in the size of the bone. In tubercular dactylitis the swelling is due more to an edemtaous infiltrated condition of the soft tissues than to enlargement of the bone. In the latter cases breaking-down of the tissues and ulceration are more apt to ensue. Specific dactylitis is more apt to be symmetric.

The diagnosis between syphilis and rachitic bone-lesions may become of great importance. Epiphyseal swellings occurring under six months are apt to be syphilitic. In syphilis the epiphyseal swelling may be unilateral, but it is always symmetric in rachitis. In doubtful cases the swelling must be subjected to specific treatment. It is well to remember, however, that rickets and syphilis may coexist in the same case. There is almost invariably enlargement at the costochondral *junctions* in all cases of rickets, which is absent in syphilis.

A word must be said concerning the so-called Hutchinsonian triad—the association of interstitial keratitis (or iritis) with syphilitic deafness and Hutchinsonian teeth. When these three conditions appear in the same subject, they furnish indubitable evidence of in-

herited specific disease; but we would not have our readers think t association a common one. The diagnosis of syphilis must often made upon much less positive evidence.[1]

Prognosis.—Above one-third of fetuses affected with syphilis d before birth, and about the same proportion of those born alive peri inside the first six months. The earlier the symptoms appear aft birth, the severer will the type of the disease be and the worse is t prognosis. If the digestion remains good and the food supply wholesome, as in those provided with good breast milk, the infa may grow up and thrive. The better the circumstances of hygie and environment, the better the chances for full recovery. A seve coryza interfering with blood aëration exerts a very destructive effe and demands careful treatment.

Treatment.—In the management of infantile syphilis the p sibilities of prophylaxis are large if the parents seek timely advi As illustrating what can be done, the following instance will be su gestive. One of the authors had under treatment a gentleman w fully developed syphilis which soon became moderately controll The mouth presented abundant mucous patches, slowly healing, and flat defiance of our advice he married a perfectly healthy woman. followed our advice in other respects, which was to subject his wife, well as himself, to systematic treatment, and they each took protiodid mercury in pill form, which was selected for convenience, and contin for at least a year, at about which time a child was born which we k under observation for between two and three years, without slightest symptom showing in mother or child. This may have b a perfect result, or developmental defects may have shown themsel later. Had more thorough supervision been allowed, perfect prev tion might have resulted. Every medical student should read Brie "Damaged Goods."

One of the greatest discoveries of modern times, fit to take its pl with the discovery of diphtheria antitoxin and of Flexner's serum has b the discovery by Ehrlich of "606," or as it now is generally kno Salvarsan. Indeed, the remedy is far too new to thoroughly apprec its value. Certain it is that active syphilitic lesions have cleared up a its intramuscular or intravenous injection much quicker than under known treatment. It has also caused the rapid disappearanc the Wassermann reaction in the blood of the affected subject. What dangers of Salvarsan may be, we do not know, but certainly there h

[1] The Wassermann reaction now positively determines the existence of syphili absence or its cure. When the blood gives a negative reaction in nervous syphilis cerebro-spinal fluid should be subjected to the Wassermann and Noguchi tests.

been relatively few untoward results up to the present time. The usual dosage is 0.5 grm. for every 60 kilos of body weight, though young babies have been given as much as 0.1 grm. We have had no personal experience with Salvarsan in infants or young children; but what we have seen of its employment in older subjects would lead us to assert that the injection should be given by one thoroughly acquainted with the technic of the intravenous procedure, and that the injection should be given in a well-equipped hospital. After the injection the patient should be treated with mercury.

In the treatment of the syphilitic infant it is necessary to use specific medication, and along with this conscientious attention to nutrition. Mercury in some form is certainly the next best remedy. Internally it may be given to the mother, and through her milk the child is more or less affected. For the medication of the child directly, mercury is best given by inunction, although in this form it occasionally disagrees; or internally, when it is much more likely to disagree; or both, or alternately. This treatment at times must be omitted for a few weeks, and iron and cod-liver oil and other tonics substituted. The form for inunction may be the mercurial ointment, diluted, if necessary, where the skin is oversensitive, or in its full strength and freely where it is necessary to produce a prompt impression; and, indeed, it is important that no time should be lost in impressing the system with the drug. A 10 per cent. solution of the oleate of mercury, of which five drops are rubbed in three or four times a day, is an excellent and cleanly form. Mercurial ointment one part, and lanolin and cold cream, of each, two parts, is preferred by some. This should be smeared on a flannel bandage and applied about the abdomen, or rubbed in on the inside of the thighs or axillæ every day, using about a dram each time. Before using the external applications it is important that the skin be thoroughly cleansed with soap and warm water. Dosage must be carefully graded in giving inunctions, as it must in internal medication. Internal medication, on the whole, is more accurate and satisfactory, and various forms of mercury are recommended, in most cases the iodids also, but strict care should be taken to keep the mouth perfectly clean or stomatitis will result. The indications and doses depend to a great extent on the locality or organ affected—whether the skin, mucous membrane, lymphatic glands, muscles, blood-vessels, bones, viscera, nervous system, or the sensory organs, and upon the time at which the first symptom was recognized.

Internal medication consists at first of the various mercurial preparations, and later of iodids and tonics—hematics and reconstructives.

Recognizing that the lesions of hereditary syphilis are mixed lesions from the first, we most often employ mixed treatment. It would seem that the study of the treponema pallidum has taught us much that is practical concerning the treatment of syphilis. Treponemata disappear from the lesions when mercury is given in full doses; but the iodids do not have the slightest influence upon them. And yet it is common clinical knowledge that gummata disappear when iodids are administered in large doses. It seems clear from these facts that mercury is of value in all stages of syphilis, it is the specific that iodids are useful to aid in the absorption of formative lesions. Osler, quoting from Hutchinson, uses the gray powder—mercury with chalk—from 1/15 to 1/2 of a grain, four to six times a day, guarded, if necessary, by a small quantity of Dover's powder. We have seen these results of Osler's, know them to be brilliant, and prefer the same remedy. Jacobi recommends small and frequent doses of calomel, 1/20 to 1/6 of a grain three times a day, for months in succession. If diarrhea occurs, he adds to each dose 1/20 to 1/12 of a grain of Dover's powder. Bichlorid of mercury is advocated by many. Van Swieten's liquid has enjoyed a large reputation and still has many advocates. This consists of bichlorid of mercury, 1 part; water, 950 parts; rectified spirits, 100 parts; five to twenty drops in milk three times a day. Baths of mercuric chlorid are also useful, the child being placed in the following bath for fifteen minutes: Mercuric chlorid, 4 grains; ammonium muriate, 6 grains; water, 2500 grains, or bichlorid of mercury may be given in various combinations, from 1/200 to 1/60 of a grain twice or thrice daily. A good menstruum for this, especially if intestinal irritation ensues, is elixir of pepsin or elixir of bismuth. The continuous mercurial treatment should be continued for about one year; after this it should be given at intervals or in smaller dosage for a period of two or three years more. The treatment is similar for those cases of infants and children who have acquired syphilis; this may come about (Jacobi) by the ritual sucking-out of the circumcised prepuce, the syphilitic nipples of a mother or nurse, kissing, the use of infected instruments, and, in older children, sexual contract (rare). The acquired form of syphilis in infancy and childhood is apt to run a swifter and more deleterious course than in adults. When it becomes necessary to check the ravages of syphilis at once, mercury should be given subcutaneously; and here calomel is not so well borne in children as the bichlorid of mercury, one to two grains in an ounce of distilled water from 1/100 to 1/50 of a grain once daily. Children bear the iodids in full doses remarkably well. Under all circumstances the treatment

must be persisted in for many months after the disappearance of the symptoms. We find it a very common practice among general practitioners, to administer specific treatment until the lesions disappear and then to omit it. Nothing could be more radically wrong. The hereditary form of the disease should be treated just as long or longer than is the acquired form of adult life.

The constitutional disorder may break out again in one of many ways, producing osteitis, sclerosis of nerve tissues or processes affecting the brain or spinal cord, or meningeal exudation. The local treatment of mucous patches, excoriations, and especially of the coryza is very important. The nose should be kept clean by a wash, such as Dobell's solution or boric acid in solution; so, also, to the mucous patches, and other surface lesions. Mild specific medication is demanded, such as black wash. A 2 per cent. solution of Squibb's oleate of mercury is useful applied to the nose, or fifteen grains of calomel to one ounce of liquid petroleum applied to the nose or to condylomata. These last may be dusted with calomel alone or with calomel and boric acid. Nitrate of silver is of value for indolent lesions and mucous patches in the mouth or on the genitalia. Sluggish symptoms, such as lymphadenitis or pulmonary infiltrations, where there is reason to suspect syphilis, will often yield most promptly to mercurial treatment, even though it is not certain that these arise from syphilis any more than from scrofula or tuberculosis.

Syphilitic ulcers should be cleansed, then cauterized by silver nitrate, and covered with mercurial plaster. For stubborn syphilitic affections Ullmann recommends electric mercuric chlorid baths. The baths should continue from thirty to forty minutes, the electric current to be passed through the bath from 100 to 200 m.am. The addition of ten grains of calomel to ten gallons of water is a useful measure. Thyroid extract has been highly recommended. Menzies reports four cases of malignant syphilis which he treated by thyroid extract, no other remedy being used. He noticed an improvement in all the cases. From this he concludes that the remedy is a powerful skin tonic and a useful adjuvant to mercury and potassium iodid in the treatment of syphilis

Türbinger has called attention to the fact that during mercurial treatment syphilitic patients occasionally develop nephritis. Out of 100 cases, eight had developed albuminuria in consequence of the absorption of mercury. Some believe that nephritis is due to the use of insoluble preparations of mercury; the treatment in these cases is to be discontinued, and during a long mercurial course, examination of urine is not to be lost sight of. Nephritis has certainly resulted from mer-

curial treatment and the kidneys always need careful attention the whole period of treatment. All sufferers from syphilis watchfulness for years, and the use of carefully selected food and nutritive stimulants.

A very large measure of attention must be given to the health of children suffering from syphilis, who are peculiarly fee deficient in resistance. This subject is elaborated in the dealing with the subject of development.

DIPHTHERIA

Diphtheria is an acute, infectious disease occurring spor and epidemically and caused by the Klebs-Loeffler bacillus. characterized clinically by a specific inflammation of the membrane of the throat, followed by the formation of a memb exudate upon, and resulting in a local necrosis of, the parts affect by the development of a peculiar toxemia.

This disease usually selects for its site the tonsils, phary larynx; it also appears in the nose, and exhibits a marked te to spread to other mucous surfaces, even to the utmost ramifica the bronchi. It is attended with engorgement of the ass lymphatic glands. Occasionally it attacks the abraded surface skin or the genitalia and the freshly cut surfaces of recent operati

Constitutionally, diphtheria is marked by irregular fev pronounced debility and it is frequently accompanied by albun Death is brought about usually by toxemia, heart failure, or m cal obstruction of the air-passages by extension of the fi exudate. It is followed by a slow, irregular convalescence, sor by lymphatism, and in severe cases by a peculiar blood c resulting in marasmus, and frequently by peculiar forms of pa

Etiology.—Diphtheria is a disease caused by the activity bacillus diphtheriæ (Klebs-Loeffler). Several microbes are associated with this in the mouth and throat, among others the ylococcus albus and aureus and the streptococcus pyogenes, may themselves become active and alter the course of the (See Septicemia.) Certain harmless microbes may also be and even accumulate in the lymph-vessels leading from the in surface.

By some, diphtheria is still regarded as a constitutional disea a local manifestation, developed during its course. The prepon of the clinical and bacteriologic proof is in favor of the view tha

fins as a local malady. The bacillus diphtheriæ was discovered by Klebs in 1883, and Loeffler in 1884, who were the first to isolate and cultivate the micro-organism, which bears the joint name, Klebs-Loeffler. Inoculation into the lower animals produces the characteristic syndrome of diphtheria, which is the formation of false membranes with an underlying necrosis, along with paralysis and albuminuria. The bacillus produces certain poisons or toxins, which are absorbed by the lymphatics and blood-vessels and give rise to serious constitutional symptoms. The isolated toxin, if introduced in small increasing amounts into the circulation of animals, produces an increasing degree of immunity. The serum of such immunized animals produces immunity in man. The action of the attenuated diphtheric virus when injected into man or animals destroys the toxins formed by the bacilli, but not the bacilli themselves.

Diphtheria is common among certain of the domestic animals, particularly cats. It is easily transmitted from animals to man, and conversely. Cows which have recently calved frequently suffer from an affection which dairymen call "chapped teats." This has been found to be identical with the condition produced by inoculating the teats with Klebs-Loeffler bacilli. When it is taken into consideration how favorable a medium for the cultivation of the diphtheria bacillus cow's milk is, and how rapidly these germs multiply, an epidemic of diphtheria may thus be easily started.

There is ground for belief that there are two varieties of diphtheria bacilli—the one virulent (pathogenic) and the other harmless (non-pathogenic). An innocent variety of diphtheria germ is often to be found in the pharynx of healthy children and others. False membrane appears upon the mucous surfaces from various causes, chiefly from irritation other than that of diphtheria. The habitat of the microbe when outside of the body is not yet clearly understood, but it is found in filthy accumulations, especially of human and animal refuse, and has a marked causal relationship to damp localities. It has been noted that diphtheria began after the use of horse manure on a field or garden spot in a locality hitherto free.

Diphtheria is transmitted usually by direct contagion, although it is capable of transference by various means and is inoculable. Diseased or abraded surfaces are far more susceptible than healthy ones, and mucous surfaces are the usual site. The radius of contagion is limited to a few feet, and with reasonable precaution it is not dangerous to approach one so affected. Unhygienic conditions, such as dampness, darkness, and the like, not only favor the spread of diphtheria, but

lower the resistance of those who live under such devitalizing co ditions. Children are much more susceptible to diphtheria than old persons, but the disease may occur at any period. White childr under five are most susceptible (Billings). The propagation is favor by cold and damp weather, unhygienic surroundings, excessive e posures, and overcrowding. One attack does not confer immuni for a length of time, but, on the contrary, seems to render one mo susceptible to the disease. Diphtheria may accompany other diseas especially acute disorders of the throat. Epidemics of diphtheria a apt to follow the prevalence of other contagious diseases. Diphthe and typhoid fever frequently prevail at the same time and in the sar locality. A tissue of lessened resistance in the nose or throat (ad noids and hyperplastic tonsillar tissue) certainly predispose to t infection of diphtheria. Laryngeal diphtheria frequently comp cates measles, and is a most fatal sequel thereto; though is m be admitted that some of these membranous invasions of the lary are not due to diphtheria bacilli but to streptococci, etc.

Pathology.—In diphtheria the inflammatory processes are m commonly confined to the fauces, tonsils, and pharynx, although th frequently extend to the nose, trachea, and bronchi, and occasiona to the mouth, lips, esophagus, conjunctiva, middle ear, stomach, a genitalia. It may also affect freshly cut surfaces, notably tracheoto wounds, the prepuce in circumcision, and the umbilicus in the ne born.

The membrane presents at first a whitish, then an opalescent, a finally a muddy gray, appearance; in the last stage it resemble necrotic portion of mucous membrane. This false membrane is v adherent, but when forcibly removed, displays a hyperemic muc membrane beneath, usually intact, and only rarely, except on the t sils, is there a tendency to ulceration. During the progress of the d ease the exudate becomes quite thick, and is composed of several lay of fibrin, the lower ones being the most recent in formation. In tonsillar variety it may be in such mass as to block the passages tween them completely. If the membrane covers the pharynx a uvula, it may appear as one sheet (emplastered membrane), and w separating, may do so in a mass, leaving a healthy mucous membr beneath.

In the nasal variety the membrane is thickened, of pinkish color, separates in mass. In the laryngeal variety the membrane is wh sometimes pinkish, and may extend to the trachea or even to the bi chi, and may also be rejected in mass, exhibiting a cast of the parts

structed. The lymph-nodes of the cervical region are very uniformly affected in tonsillar or pharyngeal diphtheria. The spleen is enlarged and congested, and the pulp is softened. The liver, also, is congested, with areas of necrotic cells peculiar to this disease. In the kidneys, according to Welsh, hyaline changes in the glomerular capillaries and small arteries are characteristic features of the nephritis of diphtheria.

In malignant cases dying early cardiac thrombi are found, and the heart muscles is invariably affected. Degenerative changes have been demonstrated in the cord and spinal nerves, as well as in the pneumogastric and spinal accessory nerves.

Bauer and Deutsch, who examined the stomach-contents of a large number of children suffering from diphtheria, found that in no case was there free hydrochloric acid present, and the amount of the combined acids was lessened. After the injection of antitoxin the free hydrochloric acid reappeared in the majority of instances in from twenty-four to forty-eight hours. When it did not, the amount of the combined acids was greatly increased. In fatal cases which had been injected the free hydrochloric acid did not reappear at all, and this may be of value in prognosis. In cases treated without antitoxin free hydrochloric acid did not come back until full convalescence. The motility of the stomach was in proportion to the amount of acid. The absorption remained normal.

Bronchopneumonia, edema of the lungs, and emphysema are also frequent sequences, and by reason of the various pathologic changes the blood itself is altered, a reduction being found in the number of the red corpuscles as well as of the hemoglobin.

The Membrane.—The fibrinous network contains within its meshes numerous epithelial cells, leukocytes, serous exudate, and diphtheria bacilli. The upper layers of the membrane also contain great quantities of cocci, which, however, bear no known relation to the etiology of the disease. The mucous membrane itself shows inflammatory infiltration.

Symptoms.—The incubation period of diphtheria varies from two to ten days, according to the severity of the epidemic and the physiologic resistance of the patient. It is hard to estimate it, because healthy children may carry virulent bacilli in their throats or nasopharynges for a considerable period of time. The symptoms are both local and constitutional. Mild and malignant cases develop near and from each other.

The prodromes of diphtheria resemble those of other infectious diseases, exhibiting slight chills, moderate fever, malaise, and some

degree of pain in the back and limbs. In the onset of very mild ca the symptoms may be trifling, so that the patient is often up and arou In general, it may be stated that diphtheria is an insidious disease, patient usually appearing not so ill as in lacunar tonsillitis. Sor times, however, the fever in the first twenty-four hours of the att may reach 102° or 103° F. (38.8° to 39.4° C.). In severe cases the te perature may be subnormal. The course is quite irregular. The pu is rapid and feeble—from 100 to 120 beats a minute; sometimes a d of one in twenty beats a minute occurs—and very frequently it is dicro Diphtheria is almost invariably an asthenic disorder from start to fin The first well-marked symptoms in a typical case are usually thos throat inflammation: the little patient complains of difficulty in swall ing, feels tender under the jaw, and somewhat stiff in the muscle the neck. In twelve or twenty-four hours from the onset a gra pellicle often forms upon the tonsils, and the cervical glands will found swollen.

The most characteristic feature is the constitutional disturba with marked debility, which is out of proportion to the severity of fever. At first the throat may show nothing, or be only hyperemic swollen. Spots may not be seen at first, or begin as small, adhe patches, grayish- or yellowish-white, usually upon the inner surfac one or both tonsils. These may at first be scarcely perceptible, cept as slight opacities, but the tendency is to spread, covering tonsils and meeting in the center. There is little or no pain, o may become severe. Weakness and pallor increase. The cours the fever is irregular. The heart early shows special enfeeblem the breath becomes fetid, and the tongue is usually coated and swol The appetite disappears, nausea may appear, and the bowels bec costive. The glands of the neck are usually swollen, sometimes s metrically. The urine may grow scanty and highly colored, or m tain a natural appearance, with albumin showing in two or three d In mild cases the symptoms subside in a week or ten days, the pa becoming much enfeebled and convalescing slowly; in severe c the weakness grows extreme, and the obstructive symptoms prog If the nose is involved, there are the usual symptoms of obstruc and the secretions excoriate the upper lip and emit an extremely o sive odor. Epistaxis is a common occurrence. The glands a the jaws and neck become enlarged and tender, especially when nose is affected, sometimes involving the connective tissue, stiffe the whole neck. When the larynx is first attacked, it usually be on the third or fourth day, and is shown by hoarseness and obstru

breathing (inspiratory stridor), with a peculiar croupy cough and symptoms of cyanosis, with increasing dyspnea. (See Membranous Croup.) The coughing-up of bits of membrane may relieve this for a time, but the membranes soon form again and the trouble may return and become urgent for relief. During the progress of this local disturbance the constitutional symptoms are liable to grow worse, with depression of pulse and circulation and increase in the kidney complications, casts and blood-cells showing in the urine; along with this is an extreme prostration. Death may result from suffocation unless the symptoms are relieved by intubation or tracheotomy.

The difficulty of breathing may be due to increase in the amount of membrane, from swelling of the false membrane, the detachment of a portion stopping up the glottis, or acute engorgement of hypertrophied tonsils already existing. Only membranous laryngeal involvement, however, tends to cause inspiratory stridor, a slowed respiration rate, suprasternal and xiphoidal retraction, and the typical "choked" cough and voice. Respiratory disturbances dependent upon toxic states may be readily differentiated.

Albuminuria is present in nearly all well-marked cases, usually appearing between the third and the tenth day. This may be due to acute nephritis or to the effect of the toxins on the glomerular epithelium of the kidneys, or from imperfect aëration of the blood in the late stages of the disease. Albuminuria is most often attributable to changes in the epithelium, the "acute degeneration" of Delafield. This change is brought on by the toxic state, causing cloudy swelling of the epithelium of the tubules. The amount of albumin is usually slight and usually disappears with the subsidence of fever. On the other hand diffuse nephritis may result and rapidly produce death.

The pulse is nearly always rapid, and if it falls below the normal rate, is a sign of serious cardiac weakness. Tirard says the chief characteristic of the pulse of diphtheria is its disproportionate rapidity as compared with the temperature. He also calls attention to the early loss of the knee-jerk on the first, second, or third day, and this, he claims, is a valuable aid in diagnosis.

A certain number of cases assume a malignant type even from the very beginning, and the system becomes overwhelmed with the intensity of the poison; or the severity of the disease may show itself in excessive membrane formation.

In the preantitoxic days, the average course of a case of diphtheria was from about ten days to two weeks. Just as antitoxin has affected mortality statistics, so has it lessened the period of illness and modi-

fied its course. If the specific is used early, the membrane
febrile temperature seldom last more than 48 to 72 hours.
and protracted cases may last several weeks; but these are re
of mixed infection, and the pus cocci, not the diphtheria ba
responsible for the prolongation.

The paralyses which follow diphtheria are due to periphe
involvement and are usually only motor. They are peculiar
ways: One set of muscles may be losing its force while a
regaining, but all are likely to get well in the long run. T
jerks are usually absent, and there is little or no pain or te
The part usually affected is the soft palate, which loses bo
and sensibility and also control over the acts of swallowing ar
ing. The muscles of the eye are sometimes paralyzed; al
both vocal cords; or, again, the diaphragm, the cervical
the sphincters of the bladder and rectum, and frequently t
lower extremities. (See Neuritis.) Endocarditis, pericard
meningitis are rare and are usually observed in septic cases.
be recalled, however, that diphtheria always affects the myo
(*vide supra*).

Diagnosis.—Since the discovery of antitoxin and the sp
sults of its early use, greater efforts have been made for an ea
nosis. Certain specialists in diseases of the throat, and so
regard themselves as such, claim that they can differentiate
the simpler inflammations of the throat and the milder forms
theria. To a limited extent this is true, but such diagnosis is
relied upon. The bacteriologic demonstration of the Klebs
bacillus, which can now be secured with great promptitu
our larger and in many of our smaller cities, is the most reliab
But this also has its limitations, as has been well said by Welch
mere presence of the diphtheria bacilli in the throat of a p
more proves that he has diphtheria than the presence of the
coccus in his saliva establishes the fact that he has pneumonia
only decisive method, as claimed with much justice by Rung
trol experiments in the way of animal inoculations. This co
however, is not a practical one, for the demonstration takes
In the concealed forms of diphtheria, as in the trachea or th
the difficulties of diagnosis are large. But it is always safe t
that a case is diphtheria when the very slightest patch appea
or after or during a croupy paroxysm, even should such a patc
upon the tonsil, uvula, pharynx, or palate. It is now conce
membranous laryngitis may be produced by pus cocci al

unassociated with the Klebs-Loeffler bacillus. Such cases are rare, however, and boards of health do well to regard all of them as cases of laryngeal diphtheria. In practice, too, it is well to view all cases presenting the symptom-complex of membranous laryngitis as cases of diphtheria of the larynx. Membranous laryngitis of streptococcic origin occasionally occurs subsequent to an attack of measles.

Scarlatina exhibits a sore throat closely resembling diphtheria, and the two diseases may coexist. The scarlatinous throat is much more diffusely red than in diphtheria. There is also the characteristic tongue, but in the membranous anginas of scarlet fever, if the complication is not diphtheria, the patches will be found on both tonsils, and the tonsils, as well as the lymphatic glands, will invariably be found enlarged and swollen. The membranes in scarlet fever are found soft and spongy, and appear to be embedded in, and not upon, the tonsil, as is always seen in diphtheria. In general, when exudate occurs early in scarlet fever (anginoid cases) it is pyogenococcic in origin (streptococcus); while membrane appearing late in the disease, even during convalescence, is liable to represent a complication with true diphtheria. No clinical diagnosis alone should settle this important question when recourse to the laboratory is possible. Bacteriologic examination shows the streptococci in scarlet fever, and not the diphtheria bacilli,[1] unless this last is a complication. In case of doubt it is a safe practice to administer antitoxin, and where there is mixed infection, the additional use of the antistreptococcic serum is indicated.

Certain patients are met with who exhibit pseudomembranes with every attack of tonsillitis, and cases of follicular tonsillitis with large exudation give much concern. (See Tonsillitis.) Where the history points to exposure, it is always a safe practice to give a curative dose of antitoxin, even though the question of diagnosis be a debatable one. Every condition of acute sore throat in a child should be viewed with suspicion, and none is too trifling to warrant the omission of a bacteriologic test. When a test is impracticable, certain clinical manifestations enable us to decide with some certainty.

The question of infection always enters into the discussion of diagnosis. It is, therefore, sound practice always to isolate a case of throat disease which presents an exudate, for clinical as well as bacteriologic tests have proved that they are most always contagious diseases.

Prognosis.—The vigor of the individual is little or no guide as to

[1] Dr. Wm. M. Welch, at the Municipal Hospital of Philadelphia, finds the Klebs-Loeffler bacillus in one-third of all cases of scarlatina.

the likelihood of recovery. When important organs are seriously damaged, the case is more desperate. Paralyses may arise as readily in originally strong as in weaker children. The severity of diphtheria varies considerably in different epidemics, but at any moment septic conditions may arise in even the mildest cases, ending fatally. The earlier the treatment, the better the prognosis. The quantity of membrane is usually, but not always, an index of the severity of the disease. The laryngeal form is liable to be fatal in babies and young children from mechanical interference with breathing. When diphtheria involves the nose, danger is great, because of the greater vascularity and abundant lymphatic vessels there which readily absorb septic material. It must be remembered, though, that there are two forms of nasal diphtheria. The first, involving the anterior nares alone (pseudomembranous rhinitis) may be an exceedingly mild disease. The patient, seemingly very little disturbed, may mingle freely with others and convey the disease to many. The second form, diphtheria of the posterior nares and nasopharynx is the most rapidly fatal form of diphtheria. The abundant lymph supply of this latter region insures a rapid and dangerous toxemia. Scrofulous children succumb readily to diphtheria, and so do those convalescing from measles. The death-rate of diphtheria was from 40 to 75 per cent. and until recently, despite all efforts to the contrary, this has remained about the same. Half the fatal cases are under five years of age. Since the advent of antitoxin, the mortality records have been reduced materially.

Treatment. *Prophylaxis.*—The most important point in the treatment of diphtheria is, without doubt, a thorough and widespread popular knowledge of the subject and the possible means of its prevention. This will enable the medical adviser not only to limit the spread of the disease on making its appearance, but elicits the assistance and cooperation of the family and the community. Isolation of the patient should be prompt and complete, and maintained so long as the germs exist in the throat. The time of its disappearance may vary from a few days to, in one reported instance, seven months. One observer has reported several cases in whom the germ persisted for forty days; the average is about fifteen days. Great danger may arise from a very slight case, whether it is recognized or not, and the mild, oftentimes unrecognized, cases are likely to prevail when diphtheria is epidemic. The habit of promiscuously kissing among children is pernicious, and contributes largely to the spread of diphtheria and other infectious diseases. Malignant cases are readily acquired from

the simplest ones. All children with sore throats, when diphtheria is prevalent, should be isolated and carefully treated; all suspicious patients should be examined bacteriologically and the greatest precautions taken, even when the diphtheria bacillus is not found; but where the staphylococcus is demonstrated, every precautionary measure should be employed, whether in families, schools, asylums, or hospital wards, and every suspicious case instantly set apart and guarded. If the disease shows itself in several instances in the same school, thorough hygienic measures should be pursued and the school closed for a sufficient time. In the event of death from diphtheria the body should be wrapped in a sheet soaked in corrosive sublimate solution, and immediately placed in a sealed casket; the funeral should be strictly private.

A patient with diphtheria should be placed in a large room, free from all hangings, rugs, and unessential furniture, and kept quietly in bed. The temperature of this room should not rise above 68° F., and even in comparatively cold weather free ventilation should be maintained by opening the windows, or those in an adjoining room if drafts are feared. Sunlight is also desirable. An open fire is of importance for ventilation as well as warmth. In warm weather a lamp burned in a fireplace, to cause an upward current of air, is of value. The bed should be a single one, with opportunity to approach on either side. All discharges from the patient should be thoroughly disinfected. Clean gauze or absorbent cotton are to be used instead of handkerchiefs or towels, or even tissue-paper, and everything promptly burned after using. The patients dishes should be kept in the apartment. No one should be allowed in the room except those immediately concerned in the care of the patient, and such persons demand special treatment and strict quarantine. The physician, on entering the room, must be overclothed with garments upon both body and head, which should be disinfected thoroughly. He should also wash his face as well as his hands before leaving the room. The face-guard, such as is described by one of the authors in the "Medical News," 1895, is of value to prevent particles of infection from being coughed into the face—useful both for physician and nurse. Those in constant attendance had better spray their own nostrils and throats several times a day with some cleansing solution. The crowding together of diphtheric patients in the same room or ward is to be deprecated, as it increases the virulence of the disease. Particular attention should be given to the throats and mouths of exposed children, especially to the teeth and tonsils.

We think it proper, for convenience, to divide the treatment i different stages, as follows:

First Stage.—The stage of incubation or bacteriologic diphtheri from the time of exposure to the first appearance of the exudate.

Second Stage.—The stage of invasion—from the time when exudate first appears to its height.

Third Stage.—The disease proper, where the diagnosis is cert both by clinical manifestations and bacteriologic tests.

Fourth Stage.—The graver features and complications.

Fifth Stage.—The decline—where the disease has pursued a g eral course, indications pointing to a recovery, the patient's bl assuming immunization.

Sixth Stage.—The sequelæ.

One should be familiar with the disease, so that he can judge what stage the treatment is indicated. If the recognition is pron the first and second stages will result favorably, under modern meth of treatment. It is in the third and fourth stages where the judgm of the physician is tested, and the result ofttimes depends upon clearness in noting the dangers and how to prevent or cure th Heart failure cannot be remedied, but the knowledge that it is pending should teach one to prevent its occurrence, and by judici medicaments remove the first symptoms that indicate beginning dan No child should be allowed to sit up for at least two weeks after active signs of the disease have disappeared. The heart muscle has been said, is invariably affected, and strain thrown upon organ may result in dilatation, even though heart failure does not oc Again, where diphtheria is seen at the height of the disease, the q tion may pointedly arise, is the danger diphtheria toxemia, or sep mia, and it is utterly useless to apply antitoxin in a septic case i attention is paid to the septic conditions. If the case is seen in fifth stage, it is still necessary to apply treatment, for the immun tion which the blood of the patient is undergoing may be only pa and even after a case is regarded as cured reinfection may take pl and the work may have to be repeated. One of us has seen a where the attack returned three times notwithstanding curative d of antitoxin were administered at each attack. Each return was severe than the former and finally the child was cured. Often has been seen where a diphtheria of the faucial variety, treated u the old methods and pronounced cured, has returned in a n dangerous form—the laryngeal—necessitating intubation and further use of active therapy. So it must always be understood

diphtheria should be specifically treated, no matter under what conditions it is seen, and no case pronounced cured until the throat is free from the specific bacteria and the patient well of any complicating sequel. It is well to follow, as a general rule, the following method of disinfection:

Disinfection.—When a child has been relieved from imminent suffocation or has received an injection of antitoxin and is placed in a position of relief, choose two rooms in the house, or, if this is impossible, one large room. Other things being equal the room or rooms should be in the uppermost story of the house. This being clean and heated, preferably by an open fire-place, remove the child to it without delay. The room vacated should be cleaned at once by the modern formaldehyd treatment, after 24 hours the room is to be opened and aired, the floor and woodwork scrubbed with soap and water, and afterward washed with sublimate solution, 1:2000. Formaldehyd generated in a thorough manner is more efficacious than sulphur, and is now in general use. When the illness is over, the sick-rooms should be similarly treated.

The child should be washed once daily or oftener, and dressed in fresh garments. The nourishment and medicines are to be kept out of the room and only brought in when required. The furnishing is to be the merest necessities—a bed, table, chairs, and stove. Rigid cleanliness should be enforced and carried out by the nurses. Ventilation should be of the freest, with caution; the temperature of the room should be 68° F. or less, the windows or those in the adjoining room kept open constantly, even in extremely cold weather. As much sunlight should be permitted to enter the apartment as possible. Holt says "it is often possible to withstand an enormous degree of toxemia if the patient is given sufficient sunlight and fresh air" (*loc. cit.*).

Technic of Applying the Diphtheria Antitoxin.—First, choose the antitoxin. Second, learn accurately its strength. Third, learn how to apply it by carefully estimating the needs of the individual case. It is unnecessary to give an account of the various antitoxins used in America; there are a number of firms who manufacture this in a very satisfactory manner, and they are striving constantly to improve their methods and their products. In the larger cities the boards of health manufacture serums for their own use with the utmost care, most of which have been shown to be of excellent quality. In the main, antitoxins containing the redissolved globulin in normal saline solution are preferable to the sera of a foreign animal. (Gibson method.)

The strength of the serum is expressed in what are known as im-

munizing units. This denomination originated with Behring, who first or normal serum was of such strength that 0.1 c.c. of it would protect against the ten times fatal dose of toxin when simultaneously injected into guinea-pigs. Each cubic centimeter of this normal serum he called an immunizing unit. Later it was shown that the strength of the serum could easily be increased tenfold, so that 1 or 2 c.c. of the serum would protect a guinea-pig against the ten times fatal dose. Each cubic centimeter of this stronger serum was described as an antitoxin unit, and, of course, contained 10 immunizing units. Still later it was shown that the limits were by no means reached, and he succeeded in making serums as much as 300 times the normal strength, each cubic centimeter of which contained 300 immunizing units, or 30 antitoxin units, and at present antitoxin is made of which each cubic centimeter contains 1000 immunizing units.

To apply the antitoxin, first consider the technic of application then, the dosage. At present the antitoxin is furnished by a number of firms in an aseptic glass syringe which is ready for use, and this is to be preferred to all other methods. If for any reason these cannot be obtained a large hypodermic syringe may be used. The syringe we prefer is a special syringe made for this purpose, with asbestos packing, having a capacity of five cubic centimeters, which can be measured accurately by a screw, so that the quantity to be used may be administered at one injection. This is supplied in a metal case, which allows the whole to be sterilized in boiling water before and after using. A good veterinary hypodermic syringe is satisfactory. Another excellent syringe is made entirely of metal, the plunger fitting snugly, the barrel requiring no packing. The location chosen for the administration is usually in the back, between the scapulæ, on either side of and near the vertebral column, which, being in a sort of canal, protected from pressure while the patient is lying on the back; some select the loins or sides of the chest. The skin should be thoroughly cleansed by means of alcohol upon sublimate cotton or gauze. Immediately after the injection the aperture should be closed hermetically with iodoform collodion. or two crossed pieces of new sterile zinc oxide adhesive plaster. A few turns of roller bandage around the trunk may further protect the puncture. The syringe, before each using, should be cleansed thoroughly by boiling. The whole operation should be performed with conscientious aseptic precautions. We have never met with any local trouble due to the injection, barring the soreness that lasts for 24 hours.

The Action of the Antitoxin.—"Experimental evidence, the

favors the theory that the antitoxin acts through the agency of the living bodies, and probably in the sense that it renders the cells tolerant of the toxin. It is not to be expected, then, that the effects will follow the injection of the serum with the same certainty and precision that is shown in chemic reaction. The cells must be in condition to respond in the proper way. For one reason or another this responsive power may be in abeyance; it may be weakened by intense or prolonged resistance of the diphtheria poison, by other previous or recurring diseases, by inherent weakness, or there may often be some individual idiosyncrasy which hinders the response of the cells to the antitoxin. There is also the possibility that the antitoxin may neutralize the effects of certain toxins and not others present in diphtheria. Antitoxic serum exerts no bactericidal effects upon the diphtheria bacilli, though when administered in sufficient quantity early in the disease, it arrests the spread of the disease, which is caused by the bacilli" (Wm. H. Welch). When it is used, however, the bacilli disappear from the local site of infection much sooner than in cases treated without antitoxin.

Administration and Dosage of Antitoxin.—A large aggregate experience with antitoxin has led to clearly defined and simple rules for its administration. A clearer conception of the therapeutic indications for the remedy and the recognition that there are few or no dangerous after-effects, and but few and rare disagreeable results following an injection of antitoxic serum in doses ranging from 3000 to 5000 immunizing units (7000 to 10,000 units in very severe cases), have led to the employment of larger and still larger doses; and, where repetition is found needful, at much shorter intervals than were first recommended.

The importance of inaugurating serum treatment early, recognized from the first, has grown more emphatic by accumulating evidence. All statistics show that the earlier in the course of the disease antitoxin treatment is begun, the better are the results. The mortality in cases so treated, when the disease is in its incipiency or has just established itself, is very small (about 10 to 15 per cent.), and in cases treated late, say from five to eight days, may range as high as 30 or 40 per cent. The number of days the disease has apparently progressed is no absolutely reliable criterion of the stage of development in the individual case. This applies especially to the formative period, when the disease is frequently more or less masked, and constitutes one of the several reasons why antitoxin treatment should be instituted at once in all cases which excite suspicion. In the clinical

management of all such cases, and of all acute anginas, even remotely simulating diphtheria, a full curative dose of antitoxin is the means of gaining much valuable time and the saving of many lives.

Bacteriologic examinations are of totally inadequate clinical value if the serum injection is delayed to secure a report, since too much time is thereby lost in instituting specific treatment. Furthermore, such examinations are not conclusive independent of the clinical manifestations of the disease; and, again, a considerable number of suspicious cases showing negative results in the laboratory yield with equal promptitude to the serum treatment.

Antitoxin treatment, however, is of value, even when given late, especially in the laryngeal variety. In such cases, though, large and frequently repeated doses are necessary. A thoroughly reliable serum administered at almost any period of the disease, will lessen the average mortality; it must be accepted, however, as a therapeutic axiom that the further the disease has progressed, the greater is the urgency for a large initial dose and the necessity for repetition of the dose at short intervals—once, twice, or oftener in the twenty-four hours, according to the severity of the case.

To be adequate, a curative dose of antitoxic serum must contain enough immunizing units to neutralize perfectly the specific toxins present in the system. When this is done, the system is rendered immune to any further development of the Klebs-Loeffler bacilli, and the disease is arrested. If the initial dose fails to accomplish this the disease progresses in proportion to the degree in which the dose has fallen short, or no effect at all may be produced. The repetition of the dose or its increase is then instantly indicated, and the shorter time which elapses before such repetition is made, the better will be the results.

The exact therapeutic indication, as far as concerns the number of immunizing units which should be administered in any given case cannot be determined, since there is no possible means of estimating the quantity and virulence of the absorbed toxins; hence the imperative need of a sufficiently large initial dose.

Doses should invariably be estimated in immunizing units and not in quantity of serum, since the latter is only the vehicle. The most concentrated serum—that which contains the largest number of units in a cubic centimeter—is the most desirable product to employ because of the small bulk of the dose, diminished irritation, its prompt absorption, speedy effects, and larger percentage of cures.

Immunizing doses for healthy persons who are exposed to the

contagion need seldom exceed 500 to 1000 units in adults, or children, depending upon circumstances, degree of exposure, etc., and are operative for about one month; three weeks is the minimum.

The fear once attending the administration of immunizing doses to any but the most robust children has been found groundless by Morrill's earlier experience in the Boston City Hospital, as well as by many others. At Blockley, every child is given 1000 units once a month. We have never seen an exhibition of anaphylaxis. Behring's rule is to give 100 units to an individual of about 120 pounds bodily weight. Rosenthal gave 600 units to a pregnant mother when in charge of her child suffering from diphtheria. She was subsequently confined in the same room without evil effects. Later he gave to each person where exposure was constant 500 units, and if the bacteriologic test shows the presence of the specific bacilli, the case belonged to the first stage, and a full curative dose of 1000 units was invariably given.

A curative dose should be 3000 to 5000 immunizing units, and may, if the conditions are imperative, be as high as 10,000 units as an initial dose. The age of two years may be the dividing line, below that, 3000 units are sufficient; above that, 4000 to 5000 units. This dose of 3000 units is frequently sufficient for cases seen early, in the second stage or the first day of the second stage. In well-developed cases showing more or less malignancy, in laryngeal cases, and in the nasal variety, no less than 5000 units should be given as an initial dose; this should be repeated in six, twelve, or twenty-four hours. The repetition should be in increasing quantities. Thus, if the initial dose is 3000 units and the symptoms are growing worse, the second dose should be 4000 units, the third dose should be 5000 units, and so on in increasing quantities until the therapeutic results are obtained. In serum treatment a safe rule to follow is increasing dosage if the case progresses, and never a smaller dose than the beginning one. Some operators give a large dose, and repeat the following doses of the same amount (McCallom, W. H. Park, etc.). If these rules are followed, either the large initial dose, repeating the same dose, or the gradual increasing dosage, very few cases will require more than two doses.

As the dose of antitoxin should always be given in units, without regard to quantity, it would be well for manufacturers to have the strength of each cubic centimeter placed conspicuously on the bottle. The contents would hardly be sufficient if it were necessary to divide the dose or otherwise modify the use of the remedy. Therefore each of the bottles should be labeled: 500 units (for immunizing purposes);

3000 units (curative for mild cases); 5000 units (curative for severe cases), etc.

The following rules are offered as regards dose: In the first stage, 1000 units; in the second stage, 3000 units, increasing to 4000 in from twelve to twenty-four hours if the case progresses; in the third stage, 5000 units, increasing possibly to 10,000 units in conditions of great urgency; in the fourth stage, 5000 units and 20 c.c. of the antistreptococcic serum may also be used if the case be septic, or 20 c.c. of anti pneumonic serum if the specific manifestations show the complicatio of pneumococcus or streptococcus; in the fifth stage, 10,000 unit and if the symptoms of laryngeal involvement arise, the quanti should be administered in increasing ratio, as in case third.

Clinical Manifestations of the Diphtheria Antitoxic Serum.—An toxin is manifested by its—

Effects on Pulse and Circulation.—In the faucial variety antitox produces a marked effect in about eight hours, increasing the tensi of the pulse and the reducing the rate to the normal. If it increa again, it is an indication for the use of more antitoxin. In laryngc cases the pulse-rate remains high throughout, especially in those int bated, and the indication is then for judicious collateral medication.

Effect on the Temperature.—The temperature is most profound influenced by the antitoxin in the favorable cases of simple diphtheri this decline is from any elevation to the normal. At times there is primary rise or reaction.

Effect on Membrane.—On the diphtheric membrane the effect most marked, limiting its continuance oftentimes to twenty-fo hours, causing a separation in from forty-eight to seventy-two hou when the red line surrounding the membrane is once clearly seen, a over which, Rosenthal asserted, the membrane never spreads. The is then no further need for antitoxin. The edges often curl up befo the membrane separates.

Effect on Laryngeal Diphtheria.—(*a*) Cases not requiring operatic (*b*) intubation cases.

(*a*) When used early in laryngeal diphtheria, it prevents the spre of the membrane, averts asphyxia, and practically always avoids the n cessity of intubation or tracheotomy. Very rarely, the loosened me brane produces obstructive symptoms, and intubation becomes impe tive. (*b*) In intubation cases antitoxin in a great measure prevents t need of tracheotomy. When intubation is demanded, the time requi for wearing the tube is much shortened, and tracheotomy is made u necessary. The time in which the tube is worn has been reduced fr

an average of one hundred and eighty-five and one-fourth hours to one hundred and sixteen and one-fourth hours, a reduction of sixty-nine hours.

The Action of the Antitoxin in Limiting the Duration of the Disease.—When administered early in simple diphtheria, all trace of the disease has often vanished on the third day. In the mixed contagion the infection is antagonized and the complications are to be treated without regard to the existence of diphtheria.

In the laryngeal form the stenosis disappears on the third day, unless an operation is demanded. When intubation has been done, the tube may be withdrawn on the fourth or fifth day. In the majority of cases the improvement of the patient begins obviously and at once, thus lessening the probability of complications.

Local applications are only needed for the purpose of cleanliness and for ridding the throat of the specific organisms, which may be a source of danger to others.

Unfortunately, though the power of the antitoxin is great, it is by no means a cure-all, and *complications* may arise demanding prompt and ample attention. Disturbances of the heart, lungs, or kidneys must be treated as they arise, without regard to the precedent diphtheria.

The presence of the bacilli in the throat may not be markedly affected by the antitoxin, and these may persist long after convalescence. It is important to make frequent test cultures to determine this fact.

The Influence of Antitoxin on the Mortality Records.—The mortality records in all large cities are now preserved with such care that reliable conclusions are to be drawn thence. It has been shown, without peradventure, taking all the various statistics into consideration, that the use of the antitoxic serum has enormously lessened the death-rate.

There remains, then, to consider one important point, the effect of antitoxin upon the various complications. If certain organs have begun to be damaged by the poison, or where they were unsound previously, always difficult to determine, then the disease process may not be stopped by antitoxin. It is more than probable, however, that an early and adequate dose of antitoxin will check or limit the mischief thus begun or emphasized by the diphtheria. It must be borne in mind, too, that by the curative effects of the serum many cases survive to acquire complications, which had otherwise succumbed early. Dana has given a thorough consideration of the subject of diphtheric palsies and the use of antitoxin. His conclusions are that, while the diphtheric palsies are not increased by the use of antitoxin, the fact

that they are not much affected nor stopped shows that the antit
however effective as a whole, is not given in sufficient doses to
vent the specific effect of the diphtheria on the nervous tissues. N
theless, he admits that while the antidotal action of antitoxin is in
plete so far as the nervous centers are concerned, it is sufficiently p
ful in a large number of cases to prevent serious destruction t
organism. Destructive tissue changes are not to be influenced b
specific; we must depend for their removal and repair on rationa
constitutional treatment and by meeting the special symptor
best we can.

Pneumonia is a serious and frequent complication of dipht
in children. The appearance of the antipneumonic serum

FIG. 99.—ANTITOXIN RASH (MACULAR) RESULTING FROM AN IMMUNIZING D
1000 UNITS. Every new patient is given such a dose upon admission and every
of the Children's Department immunized once a month. There has never been a
result. (Anaphylaxis, etc.) No case of diphtheria has appeared in four years.—
delphia General Hospital.)

hope of preventing this, and where the disease has already prog
of hastening resolution to a favorable termination. Nothing
way of local treatment will avail in bronchopneumonia foll
diphtheria. Antiseptic vapors are valueless, as their germicidal
erties cannot reach the seat of disease in the terminal bronc
air-cells. Inhalations of oxygen, repeated frequently on dema
symptoms, are useful partly as heart stimulants and partly to rei
the crippled lung. The use of the cold pack is not to be recomm
Some cases may be benefited thereby, while in others it is very
borne. Counterirritation with some stimulating liniment cont
germicidal properties, as the oil of cinnamon, gaultheria, and eu
tus, gives some relief. Each case must be treated with a view t
venting rather than to treating this complication, and while in
the cold pack is of undoubted utility, in others warm poultic
better, while in yet others a liniment with a cotton jacket seems

The antipneumonic serum, with judicious collateral treatment, offers more hope than any treatment. In intubation cases it is a useful precaution to keep the foot of the bed raised a foot higher than the head, to encourage the draining away of discharges. Drugs to affect the heart are nearly always necessary, such as strychnin, caffein, camphor, nitroglycerin, alcohol, and digitalis.

Deleterious Effects of Antitoxin.—Like vaccination and other procedures that have proved of inestimable service to the human race, antitoxin therapy has met with adverse criticism. A little of this is just; but most of it is without foundation. Thus the belief entertained by many laymen that "antitoxin weakens the heart" has no basis in fact. On the other hand, there is little doubt that the rise in blood pressure induced by an injection of antitoxin is directly dependent upon the increased force of the ventricular systole.

Does antitoxin ever cause sudden death? It must be admitted that sudden deaths have promptly followed even small prophylactic injections of diphtheria antitoxin. Fortunately such occurrences have been very rare; too rare to justify the desertion of a life-saving agent. Professor Langerhan's child, a well-known case in point, had "status lymphaticus." Any other injection might have terminated his life (see Status Lymphaticus). But in some instances anaphylaxis seems to have furnished the explanation. Though the children at the "Philadelphia General Hospital" are given a prophylactic dose of 1000 units every month, we have never seen a hint of anaphylactic phenomena.

Serum Rashes.—In a certain percentage of cases, the action of the foreign serum (horse serum) gives rise to subsequent toxic erythemas. In all fairness it must be said that such rashes after diphtheria were not unknown in preantitoxic days. Nevertheless, we freely admit that urticarial and other rashes follow antitoxin injections in about 20 per cent. of cases (see Fig. 99). The only symptom they cause in most cases is intense itching. The rashes are somewhat less frequent since the employment of the redissolved "globulin" (Gibson method).

The Serum Disease.—Very rarely patients may show intense reactions after prophylactic or curative serotherapy. We have seen but one such case. She was a defective of the Mongolian type. She had a very severe diphtheria, and recovered after the employment of three injections of antitoxin of 5000 units each. Three days later, she exhibited a septic temperature, swollen knees and ankles, a maculopapular eruption on the forearms, elbows and knees and angio-neurotic edema of the face. We never considered her in great danger, but she was ill for a fortnight. Von Pirquet and Schick described such phe-

nomena in 1905. To subjects with unstable vasomotor system hay-fever sufferers, patients affected by animal odors, etc., antitoxi should not be given needlessly. Both epinephrin (employed hypoder matically) and thyroid extract are said to be of value in preventin the serum disease. We have had no experience with either agent i this connection.

Because we have a specific for most cases of diphtheria, there i no reason for the attitude that all other treatment is valueless. Loca applications and certain systemic measures are still of signal benef in some cases.

Local Applications.—In diphtheria these are of great value, a should be vigorously but carefully employed, though they must be the blandest, and, of course, omitted in very young children a nervous ones who become alarmed. Local applications are usef first, as germicides; second, for cleansing purposes; third, to dissol false membranes; fourth, to allay irritation. They should be appli warm and be non-irritating.

The conclusions of Dr. A. Campbell White in determining h far the outlines of the membrane and the presence of the bacilli a influenced by local measures are as follows: (1) The prompt washi of the air-passages attacked by diphtheria lessens the duration a amount of the diphtheric membrane; (2) antiseptics of sufficie strength to be germicidal are irritating and cause extension and p sistence of the false membrane; (3) they may cause systemic poisonir (4) spraying, also the pernicious treatment by swabbing, is inefficie and by young children cannot be endured; (5) frequent cleansing the throat and nostrils with a bland solution, as plain warm water normal salt solution, is easier of application, more agreeable to t patient, and accomplishes all that can be expected of any antisep solution.

Loeffler reports excellent results from the use of his so-call "toluol" solution for the local treatment of diphtheria, and he regar it as sufficient without other specific remedy. He claims a low m tality, general applicability, whether in true diphtheria or mixed inf tions, and absence of any injurious working, considerable prophylac action in destroying at once the source for the spread of the disea and, finally, its cheapness. This solution, as recently modified, is follows:

Menthol	20 gm. dissolved in toluol sufficient to make 36 c.c.
Absolute alcohol	60 c.c.
Solution of ferric sesquichlorid	4 c.c.

We have been disappointed with this treatment.

The ferric solution may be substituted with advantage by 2 or 3 c.c. of creolin or one minim of cresol, absolute alcohol up to 100 c.c. This toluol solution will keep in dark-colored bottles with glass stoppers for months. The method of application is as follows: Superficial mucus being removed by revolving over the membranes a large swab of cotton, a fresh swab carrying the solution is pressed firmly for ten seconds against the affected spot, and this repeated until the whole membrane has been treated. Since it is painful, it must be done thoroughly at the first attempt. This has given good results in the hands of many, used once or twice a day, seeming to check the spread of the membrane, and sequels are rarely observed. It is well to bear in mind that local pains follow the application of Loeffler's solution, but this is less since the addition of the menthol. Guaiacol, applied in the same manner as Loeffler's solution, possesses the same virtues, but has the same defects, causing pain on application. The use of cocain or chloretone previously may alleviate this. A large number of local applications have been recommended, such as peroxid of hydrogen, pyrozone, hydrozone, mild solutions of bichlorid of mercury, etc. Jacobi recommends a spray containing one grain of corrosive sublimate to the pint, adding a dram (℥j) of table salt. Excellent results are claimed by Flick, Judd, and others in the local use of calomel in powder, diluted or of full strength, especially in the nasal form, and wherever the membrane can be reached. A number of cases occurring in Flick's own family, as well as in those of his friends, have been most successfully treated by this means, along with the internal administration of calomel in small doses, constantly repeated—1/120 to 1/40 of a grain every fifteen minutes. This he regards as both a local and systemic measure. We have tried this treatment in several cases, with very excellent and prompt effect. Saturated solution of borax and water is also cleansing, but common table salt, one dram to a pint, is more generally accepted. Glycothymoline, diluted 1:4, is both cleansing and cooling, and, not being poisonous, can be used copiously.

A solution of boric acid is used by the Germans. Various solvents for the mucous membrane are occasionally applied, such as pancreatin or papayotin, 1:20 in water. Trypsin or pepsin, 1:20, with hydrochloric acid and glycerin and caroid in powder, have all had their advocates. Any trustworthy cleansing solution will suffice. Applications to the outside of the throat are usually useless to the swollen cervical glands. Lead-water and laudanum, belladonna, ichthyol, or ice-bags, however, assist in relieving pain. Ichthyol, 33 per cent., diluted

with lanolin is perhaps the best of external remedial agents, and ranks in value next to cold applications. Vapors of various sorts—turpentine, eucalyptus, and carbolic acid—sometimes employed, are of doubtful efficacy. Relief is often obtained by the use of steam generated in a croup kettle, and directed under a sheet arranged like a hood over the patient's head—always to be employed in intubation cases. Steam thus applied favors suppuration, aids in loosening false membrane, and is of special utility in the laryngeal forms. Calomel in powder, diluted or of full strength, especially in the nasal form and wherever the membrane can be reached, is the oldest of the remedies, and has been used since the time of Brettoneau. As a vapor also—calomel fumigation—it is employed in the laryngeal variety.

Great care and judgment must be exhibited in the use of the local measures, especially to prevent the patient becoming alarmed or excited, and lest through unskilful manipulation the disease should be induced to spread, or ulcerated or denuded surfaces be thus created, which become avenues for the entrance of the disease elsewhere. Where the nares are nearly occluded by a thick membrane and secretions, they may be cleansed by a cotton swab on the end of a probe dipped in a bland cleansing solution. Irrigation of normal salt solution is better from a fountain syringe with soft-rubber nose-piece, the child wrapped all about with a sheet, to restrain the movements, lying on its side, face turned down, and a steady, gentle current run into the upper nostril, the solution coming out of the lower nostril by gravity. This may be frequently tried until the solution comes through and out of the lower nostril. Then the child is to be turned on its other side and the process repeated. If irrigation of the nose produces comfort and clears away the obstructions, it serves an admirable purpose. In some cases, where the nostrils are completely occluded, a postnasal syringe may be useful. Care should be taken, however, in practising nasal irrigation that too much force be not used, or the solution may be forced into the Eustachian tubes, giving rise to much pain or great discomfort. Where there is hemorrhage, if slight, little attention need be paid to it, but if severe, astringent solutions may be used—a spray of pyrozone is perhaps the cleanest of local applications, applied to the bleeding point with an atomizer, or, if the spot be seen, on a pledget of cotton.

Constitutional Treatment.—The object of constitutional treatment is to combat the effects of toxins, and the remedies used have been selected either empirically or rationally. It is hardly necessary to review the long array of medicines which have been offered for the

purpose of combatting the essential poisons of diphtheria. Some of these still retain the confidence of many wise men and able observers. The internal use of mercury (calomel and corrosive sublimate) has still its stanch advocates; this, with the local use of tincture of chlorid of iron, chlorate of potash, and nascent chlorin, has a surprising number of advocates second only to antitoxin.

The internal use of small doses of calomel, as recommended by Flick, certainly deserves respectful attention. Flick gives 1/120 to 1/40 of a grain, alone or triturated with a little sugar of milk, every fifteen minutes, combined with the local use of calomel, full strength or triturated one-third, insufflated every hour or two. His results are flattering, and, in the absence of the more rational and efficient remedy, antitoxin, the method deserves a careful trial. In the discussion of his second paper an important point was brought out, namely: That a large proportion of those who rely on antitoxin in the treatment of diphtheria use more or less calomel also in the majority of cases. Judd urges similar measures, and purges his patients once well with the calomel. If serious evidences manifest themselves, destructive changes in the tissues, sepsis, etc., the whole dependence is to be placed on constitutional and nutritive measures and not on any specific agent.

A powerful agency is the hypodermic use of strychnin, in doses of 1/300 to 1/200 of a grain to a one-year-old babe, repeated every three to five hours, as demanded. Feeding should be so full as to be almost forced. Alcoholic stimulants are needed when clearly indicated, but are credited by some of the best clinicians with doing much harm at times. The indications for stimulants are marked prostration, feeble pulse, dicrotism, and a weak first sound of the heart.

Rational treatment should entirely depend upon the condition of each case, and should be employed as the indication may demand, while certain measures, such as disinfection and stimulants, are always in order; the employment of remedies must require judgment, for in this disease it is often a fact that the treatment becomes a routine, and no adequate regard is paid to the symptoms, dangers, or sequels. Because the study of this disease, more than many others, has become the property of the laity, it is often treated at home by the relatives for some time, and when failure results, the physician is sent for and meets the case under deplorable conditions.

TRACHEOTOMY

This classic operation for the relief of laryngeal stenosis has been slowly superseded by that of intubation, and in diphtheria especially,

since the advent of antitoxin, it has been all but ab America.

From being the only clearly indicated and rational pr position became one of uncertainty, and in intubation, as hesitation was an unfortunate one, as it seemed to affect tl and, in a choice of methods, the easier and more rationa accepted, tracheotomy has been given an insignificant pla the injustice of its value, and with a plain disregard indications.

For this reason, and while the operation of intubation the general one, it is well to always retain the operation of t in our list of surgical procedures, and to place it upon a posi by briefly enumerating the conditions which may necessitate tion, maintaining this assertion that intubation and trach not rivals in any sense of the word, but are separate and distii ings, which have certain well-defined indications for their The operation of tracheotomy then is indicated:

1. In those accidental cases in which the membranes forced down from the larynx by attempts at intubation.

2. In those cases where the membranes are too extens not to be reached or relieved by the intubation tubes.

3. In those cases, previously intubated, where there continuous formation of membranes reaching below the tul

4. In those cases where the membranes have become loos larynx, and where the choice lies between intubation and tr the latter is free from danger, for by the introduction of membranes may be forced down still further, causing asp then necessitating prompt tracheotomy.

While the operation of tracheotomy means an opening chea, the general term includes all those operations whic respiratory channel between the thyroid cartilage and the st laryngotomy).

When the operation is decided upon, the next point is site; this in a measure depends upon the time devoted to urgency of the case.

When haste is indicated, everything must give way to t with which relief must be afforded; hence the isthmus of may be divided or a large vein cut, and the hemorrhage ma trachea with the air, but this hemorrhage can be checke chances must always be taken.

A rule to follow is to make the incision as far down as

displace the isthmus upward or downward, or clamp the tissues with a hemostat and open the windpipe.

While the operation appears simple to describe and equally simple to perform upon the cadaver, it is a very trying one when circumstances demand haste. In all cases it is well for the surgeon to come prepared for such emergencies. Besides the necessary instruments, a portable electric light with a forehead reflector is a most useful adjunct. The necessary instruments are the knives, scissors, tenacula, hemostats, needles, ligature, retractors, and trachea tubes. Various kinds of tubes are to be had, but even if the tubes are not at hand, improvised retractors will suffice, which can be made of two common hairpins, bent at an angle, while the pointed ends can be fastened to a piece of tape; the bent crowns can be placed on each side of the openings and thus hold the wound apart, and permit free access of air. Even if these are not procurable, a stitch can be put on each side of the opening, through skin and tissues, into the trachea, and the long ends made to meet at the back of the patient and then tied. The patient can thus be relieved until a tube is procured. One of us has shaped an aluminum pen holder into a very respectable tube.

When operating, the head and neck should be stretched over a pillow or sand-bag. Schleich's fluid, cocain or chloretone can be used locally, unless the patient is unconscious. An incision in the middle line is made from the cricoid for five or seven centimeters downward. After cutting the skin the muscles are separated, all hemorrhage is stopped, the trachea is steadied and brought forward by means of a tenaculum; it is then incised by means of a sharp knife, care being taken, first, to cut upward, and, second, to guard against injuring the posterior wall by a sudden cough, due to the ingress of air or blood.

At first there is a violent and irregular respiratory movement, with a sucking-in of air and blood and expulsion of mucus, membranes, or the like, so that care must be at all times exhibited. After the respiration has resumed a more normal quality, attention should be paid to the parts exposed: it may be necessary to enlarge the opening for the removal of shreds or membranes.

If the operation is done secondary to intubation, the technic is the same, but the process is easier, for here the intubation tube may remain in situ and act as a guide during and until the operation is finished.

The after-treatment requires the presence of a trained nurse, and an equal amount of skill and knowledge to perform as the operation itself.

More deaths can be ascribed to the lack of after-treatment tha any defects in methods or conditions. If is for this reason that int tion has become such a favorite and will always be used when poss

After the patient has been placed in a position of relief, it is w emphasize the importance or care in the further treatment and other methods are to be pursued. As the chief danger is cause the entrance of foreign substances directly into the lungs, and a unmoistened and too cold acts as an irritant, it is well to keep room judiciously warmed: a temperature of 80° F. is not too l The bed should be so arranged that the air can be brought t child moist and free from deleterious influences.

A measure most valuable and easily applied is to keep some ab ent gauze moistened with a weak solution of bichlorid constant contact with the wound and over the opening of the tube. greatest care should be exercised in the cleanliness of the tubes, they should be changed and sterilized frequently.

Medicinal treatment should be pursued with the same regul as regards tonics, stimulants, foods, and the like.

INTUBATION OF THE LARYNX

In the course of laryngeal diphtheria a growth of the ex may become so obstructive as to require artificial means to intr air into the lungs. We are presented with two alternatives: on described as tracheotomy, by opening the windpipe below the of obstruction, and the other, the bloodless procedure of intub consisting of the introduction of a tube through the mouth int larynx, passing the seat of obstruction, and maintaining egress ingress of air through the tube left in place.

For the proper treatment of such conditions it is essential fc operator to be always prepared to be familiar with and to pr either operation, and while he may undertake and perform the o tion of intubation, he should at the same moment be ready to f this attempt by tracheotomy should the case demand it.

Laryngeal intubation is universally recognized as a life-s operation, and the honor of its creation belongs to Joseph O'D of New York. The history of intubation, like that of every successful procedure in medicine, bears repetition. Hippo attempted intubation by the use of a catheter. In 1857 Loisea tempted catheterization of the larynx as a treatment for croup, a 1858 Bouchut devised tubes for permanent catheterization, b

vere seldom applied and his method of "tubage" was lost in
n. This failure was due, not only to imperfect construction of
es, but also because intubation was tried upon the oft-fatal cases
ibranous laryngitis occurring as sequelæ to measles.

May 23, 1888, O'Dywer ("Proceedings of the Philadelphia
Medical Society," vol. ix, 1888) presented a paper on "Intu-
Tubes" and described the different stages traversed by him
e had finished the tubes now in use.

FIG. 100.—METHOD OF FEEDING CHILD AFTER INTUBATION.

Dwyer's creation was absolutely original, and he devised and
ed each tube, with the necessary instruments for their use, and
matchless ingenuity and untiring energy placed the operation
bation upon the certain foundation which it now occupies.

Dwyer's instruments consist of a set of six tubes, with a like

number of obturators, an introducer, an extractor, a mouth gag, and a gauge.

The tubes are so shaped that they approximately fit the larynx, being somewhat bulbous at their lower third, and are graded in size by the gauge, indicating the ages of those for whom they are to be used. It is essential, however, to take into consideration the size of the child, as frequently a much larger or smaller tube may be required than is indicated by the gauge, and thus some judgment should be exercises in the choice of the tube.

It is also well to remember that in certain stages of the disease the parts may be swollen or occluded by a deposit of pseudomembranes and that the safety of the operation may require a much smaller tube than is indicated by age scale, the regular tube being too large for the affected larynx, and accidents may arise from forcing the membranes down into the trachea, causing asphyxia.

It is important in using the O'Dwyer tubes to have them thoroughly cleansed after each using, and, better, regilded, thus preventing any element of contagion. In every new case be certain to use a new tube. Even should the tube be returned from the gilder and be practically new, it will always be well to cleanse it thoroughly by boiling for frequently foreign substances adhere to the new tubes. After boiling, dry by passing corrosive cotton through, insert the thread, and then the tube is ready for use.

Method of Introducing an Intubation Tube.—Two assistants are required, neither of whom need be skilful. The child, previously wrapped in a blanket or sheet with its arms covered, is placed on the lap of the one assistant, in a sitting position, so that its legs are held firmly between the assistant's knees. The patient's arms are held firmly to its sides by the hands of the assistant or nurse, in such a way as to steady the trunk, and in no way to interfere with the respiration of the child. (Wrapping in a sheet does this splendidly.)

The second assistant stands behind the child, steadies the head and holds it in correct position. The proper attitude is thus obtained the first assistant draws the head up so that the child seems to hang from the top of its head; in this position only is it practicable accurately to introduce the tube, and this attitude should be firmly maintained during its insertion.

The tube, with the silk thread clear and free, is attached to the introducer. The gag is inserted into the left angle of the mouth which is opened as widely as possible, due care being observed to prevent laceration of the soft parts.

The attempt at introduction may now be made, and should be
ıe quickly, and during expiration, for while the attempt is being
de there is complete arrest of respiration, and should membranes
dislodged, inspiration may draw them further down into the trachea
bronchi. Several short attempts are always better than a single
olonged one, and should there be a cessation of respiration or in-
mplete relief, the tube should be immediately withdrawn and a
w attempt may follow. Never use force. Very little power is
quired, except in cases of subglottic stenosis, where quite a little

FIG. 101.—METHOD OF INTRODUCING THE O'DWYER TUBE IN INTUBATION.

ce is needed to overcome the spasmodic contraction. The index-
ger of the left hand is the guide in the act of introduction. This is
sed far back into the larynx, then brought forward until the upper
rder of the cricoid cartilage is felt. This is a hard landmark, and no
ention need be paid to the epiglottis. The tube, with the silk thread
pped over the little finger of the right hand, is passed along the pal-
ar surface of the index-finger, by which it is guided into the larynx;
e handle of the introducer is drawn around so that it stands in the

median line. In this way the tube is brought into the correct pc after which it is pushed off the introducer by the trigger attacl the handle, and is simply dropped into the larynx, or the tub be dislocated from the obturator while removing the latter, and ste by placing the finger on its head, and, after the removal of the ducer, pressed gently down into the box of the larynx.

When it is certain that the tube is in position and the p breathes properly, the silk thread is cut and withdrawn, care taken not to pull the tube along with it. This is done by placi index-finger again gently upon the head of the tube.

Should there be evidence of loosened membranes, or shou relief be not marked, or if there is any suspicion that the opera incomplete, as when the tube is introduced into the esophagus, t thread should be allowed to remain, especially when prompt extu is required. It is always well to allow the thread to remain a twenty or thirty minutes or longer, until the operator is thor satisfied of the completeness of the procedure.

That the tube is correctly placed is evidenced by the prev stridulous or rasping breathing giving way to a hissing bre sound, followed by a paroxysm of coughing, excited by the irrita the tube, and by the prompt relief of the dyspnea.

The coughing is an extremely good symptom, and is the thorough and sure means of getting rid of the accumulated and loosened membranes.

The dangers of intubation are: The crowding-down of the lo membrane into the larynx, thus causing asphyxia and necess prompt tracheotomy; or the making of a false passage by usi much force and working at an angle of the mouth instead of k the median line; or producing asphyxia by prolonged or injud attempts at introduction.

There are also dangers in performing extubation. The tub be pushed down into the trachea by too firm a pressure upon the h the tube of the extractor, or injuries to the soft tissues of the lar missing the opening of the tube and dilating the extracting force widely and forcibly withdrawing. Their prevention is self-e

After-treatment.—After intubation, as soon as practicable, g patient something to drink—water, milk, wine, as the case may Permit the child to hold the glass or cup and serve itself. Ger the drink causes coughing, and thus mucus and membranes a quently brought away.

Vomiting very commonly follows intubation, the child by this

attempting to dislodge the tube, and in this it sometimes succeeds, thereby necessitating a repetition of the whole procedure. Care, therefore, must be used, and in the act of coughing or vomiting the child should not be allowed to lie upon its face; nor should it be held over the nurse's shoulder face downward, for in either position very slight exertion might cause it to expel the tube. After a while the child becomes quiet, respiration assumes a more normal character, the pallid or blue lips take on a healthy hue, relief becomes manifest, and a quiet sleep follows.

In cases complicated by grave pulmonary lesions the relief obtained by intubation is but transitory, but life can thus be prolonged so that suitable remedial agents can be administered.

As intubation is simply a means to relieve stenosis, the further treatment follows the same category as is pursued in treating diphtheria.

As is well known, bronchopneumonia is frequently a complication of the laryngeal variety of diphtheria, especially in infants; therefore the further treatment must be rather that of the preventive type. Again, intubated cases are more liable to heart failure, and due care and foresight must be directed to this possibility. It is therefore well, as a routine treatment, to administer cardiac tonic remedies, even if at the time there is no indication for their use. A very useful prescription to be given during intubation consists of tincture of digitalis, combined with strychnin and either the carbonate or aromatic spirit of ammonia, using syrup of tolu as a vehicle. Caffein often acts even better.

While intubated cases frequently get along well enough in their ordinary surroundings, the air being moistened in the natural way before being inspired, it is often necessary to place the patient in a specially moistened atmosphere. An improvised tent can easily be rigged up in any household by means of an umbrella and one or two sheets. (See Fig. 53, page 446, Improvised Croup Tent.)

Steam can be led under this canopy from a special croup kettle or from any steam kettle. Such a tent will be found very useful if complications exist or if the case is a prolonged one, necessitating frequent and prolonged intubation. Of far more difficulty is the administration of food, and here the ingenuity of the physician is frequently taxed. In the very young, where nothing but fluids are taken, this is overcome by having the head, in the act of swallowing, placed lower than the body. (Casselberry position.)

This can also be tried in older children, where there is difficulty in swallowing in the sitting position.

Often food is refused in any shape, and water is urgently demanded.

It is safe to give any quantity of water, and where there is difficulty in swallowing, small pieces of ice may be taken. Many children subsist for one or two days on nothing else but small pieces of ice. Frequently it is found that semisolids are swallowed more easily than liquids; then may be given cornstarch, wine-jelly, oatmeal gruel, eggs, and the like.

The entrance of food into the bronchi through the tube is a danger that does not exist, as has been conclusively proved by postmortem observations of Northrup, Holt, Rosenthal, and others.

External applications to the neck are often indicated, and, when required, are grateful to the patient; of these the cold pack, or ice poultice, stands first. Ice can be applied to the neck by means of an ice-bag or a sausage casing. Sometimes warmth is more agreeable.

The indications for the operation of intubation are, in the main the same as those for tracheotomy. The most pressing indication is the appearance of recession in those parts of the chest which yield to external air pressure, with continued restlessness, due to insufficient oxygenation as well as feebleness of respiration. In cases of secondary involvement of the larynx, where the patient is more exhausted by reason of the coexisting toxemia, intubation should be performed once, even before the urgent symptoms of stenosis are manifest.

The advantages of intubation are: (1) The speed with which it can be performed; (2) bloodlessness; (3) absence of shock following; (4) it can be done any time, day or night; (5) no need of anesthesia or other preparations; (6) no wound is made, thus the spreading of infection is avoided; (7) there is no objection on the part of the parent; (8) the inspired air enters the lung naturally warmed and moistened; (9) the subsequent care does not require skilled attendants.

The disadvantages are: (1) It clouds the prognosis; (2) induces a tendency to heart failure; (3) its dangers—(*a*) pushing down false membranes and (*b*) suffocation by finger or attempts to intubate; (4) difficulty in nourishing patients.

Prolonged Use of the Tube.—It sometimes happens that on the removal of the tube the patient has not fully recovered, and reintubation may be necessary; this may take place at once, usually within the first twenty-four hours, and in some instances not until a week has elapsed. When the reintubation is necessary at once, it is an indication that the exudate is still present, and the patient is still suffering from the primary disease. But when intubation is required after a number of days of extubation other reasons must be sought, and if found remedied. By the prolonged use of the tube is meant those cases

requiring the tube after the specific bacilli have disappeared, or where there is no longer any appearance of the membrane.

A tube is no longer necessary if the child can breathe without it, and three weeks should be the longest time that a tube is required because of diphtheria. After this time other causes exist, and these may be: First and foremost, paralysis of the vocal cord on either side; second, edema of the tissues; third, ulceration of the cricoid cartilage, with consequent collapse; fourth, cicatricial contractions and exuberent granulations, following ulcerations and paralysis; fifth, traumatism and its results, injuries inflicted by the passage of the tubes in or out; sixth, a too tightly fitting tube; seventh, leaving the tube in too long.

The treatment varies with the case: The first indication is collateral treatment—the large dosage of strychnin, with food and stimulants; second, the use of gentle local medication; third, the frequent extubation of the tube, with intubation of one slightly smaller. In certain of the cicatricial cases, large special tubes have to be employed, the object to be attained being such dilatation as is produced by a urethral or rectal bougie. In cases where the smaller tube is used care must always be taken that the physician or assistant is near at hand, for the patient may frequently extubate by expectoration, and death has been noted from this alone. Fourth, see Tracheotomy.

Removal of the Tube.—Extubation is more difficult than the act of intubation. The patient and assistants are arranged in precisely the same way as in primary operation. The index-finger of the left hand acts as guide for the extractor, the epiglottis is elevated, the point of the extractor enters the opening of the tube, the lever is pressed, the jaws are separated, and the tube is withdrawn in a manner just the reverse of that employed in its insertion.

When to Extubate.—The advent of antitoxin has placed the length of intubation on a more definite basis. It is safe to assume that attempts at extubation should be made on the fourth or fifth day. If the tube is withdrawn and stenosis relieved for from four to six hours, it is safe to conclude that intubation is no longer required. We should always be prepared to perform an immediate secondary intubation, so another tube should be prepared ready at hand before extubating. It is well to have the patient abstain from food for a few hours before extubation, and to give a stimulant immediately before the operation. After extubation further treatment of the patient will be required for two or three days, or until convalescence is firmly established.

SCARLET FEVER

Synonyms.—SCARLATINA: SCARLACH (GERMAN)

Scarlet fever is an acute specific disease, self-limited and very cor tagious, characterized by sudden onset, with vomiting, sore throat, an sometimes convulsions, and accompanied by a high temperature an the later appearance of a diffuse, punctiform, scarlet rash. One attac protects from others, with rare exceptions. It occurs in epidemic more commonly in the autumn and winter, but it is constantly endem in populous cities. The usual complications are membranous inflan mation of the pharynx, frequently extending to the nose and ear an occasionally to the larynx. The sequelæ have chiefly to do wi changes in the kidney and middle ear. McCallom says that nephr tis, pneumonia, pericarditis, endocarditis, dilatation of the heart, otit media, and streptococcus-infection must be considered integral par of the scarlatinal process.

Etiology.—A specific micro-organism has long been suspected to the cause of scarlatina, but no one has been isolated, cultured, or fou capable of producing the disease in susceptible animals, and accep as the causative germ by bacteriologists in different parts of the wo The complications, however, exhibit the effect of the streptococ pyogenes oftentimes, along with other pyogenic germs. Class a others have found a diplococcus (diplococcus scarlatinæ) which appeared to them to fulfil the requirements of Koch; but unfortunat their results have not been verified by other bacteriologists. Oth have contended that the disease was due to a low form of ani organism, and Mallory has found such in the secretions, desquamat skin, etc. There are still others who contend that the disease i streptococcic infection. Kolmer appears to have produced immu with streptococcic bacteria obtained from scarlet fever patie Viewing judicially the whole field of investigation, it must be said t the whole question must still be left open. We have not foun specific micro-organism that a sufficient number of bacteriologists willing to accept as the cause of this disease. The infection en the system most commonly through the nose or throat. It is by s regarded as a local disease of the throat, followed by constitutic symptoms. The severity of the angina is not always an index of general disturbance.

Predisposition plays an important rôle, individuals varying wic in this particular and the same persons at different times. Cert persons constantly exposed escape, and long afterward may contr

the disease. Only about half of the people exposed to scarlet fever contract it, so that susceptibility is not universal as it practically is in measles, pertussis, etc. Scarlatina attacks the most vigorous as readily as those of feeble constitution. Age is a potent factor in the propagation and mortality. Babes under six months rarely contract the disease, but those above one year readily do so, and among them the mortality is high. The age of susceptibility is greatest between two and five years. The school life, particularly during the kindergarten and primary grades, is of vast importance in the spread of scarlet fever. Practically, in the medical inspection of schools, it is found that both scarlet fever and diphtheria are about twice as frequent in October as in September. The lesson is easy to read. Incubation is from two to five days, more or less, but is rarely over a week. A short incubation presumes a severe case. The infection is not so readily transmitted as measles, but is exceedingly tenacious. Almost any object coming in contact with the sufferer from scarlatina may retain and convey it, especially those which have been much handled—domestic animals (pets), flowers, books, clothing, etc., are convenient vehicles—and, indeed, almost any object may be the medium of contagion. One attack usually confers immunity upon the patient for life; though one of us saw a severe second attack of scarlet fever occurring eleven years after the first indubitable seizure. The patient had scarlatinal arthritis, endocarditis, pericarditis, and double pneumonia. She finally recovered with a slightly damaged heart. The morbific principle remains active for months and even years. No age nor race is exempt. The exact origin of any outbreak is hence most difficult to trace. Milk is a recognized agent. It is pointed out by H. A. Hall that scarlatina occurs in epidemic form chiefly in countries or places where cow's milk is an article of diet, and is absent where this is not used. We have seen one local epidemic clearly due to infected milk. The secretions of the patient are the most dangerous sources of infection, in particular those from the mucous membrane and from the skin, and especially during the stage of desquamation. This last is denied by some, but cannot be practically ignored. During incubation the patient is scarcely able to communicate the disease, but as soon as the rash appears he is a source of danger, and more so when the disease is at its height and long after, indeed, until full recovery, not only from the febrile process, but from the protracted desquamation and while any catarrhal or suppurative output continues. The feces and urine are to be feared, especially when there is nephritis or diarrhea during convalescence. Quarantine should be maintained until the child is

completely recovered from the disease and the mucous membranes and skin show no trace of disturbances. Patients with ear discharges may communicate scarlet-fever to others after the disease has been thought to have terminated long since.

Pathology.—The skin-lesion consists of a true dermatitis, with dilatation of superficial vessels and infiltration about the sweat-glands. There are destruction of the lining epithelium, a filling of the lumen with granular detritus, and death of the epiderm, which is cast off during desquamation. Angina, often of a pseudo-membranous type, is the rule. Cervical adenopathies are usual accompaniments, and the adenopathy may be general. The remaining pathology will be dealt with, in the consideration of complications and sequelæ.

Symptoms.—The premonitory symptoms of scarlatina are rarely absent, and are usually severe, and consist of vomiting, chills, fever, convulsions, angina, etc., and constitute in some sense an index of the severity of the attack and are promptly followed inside of a day or a day and a half by the rash. In a large majority of cases the disease arises suddenly. In serious cases the fever rises abruptly to 104° to 105° F. (40° to 40.5° C.), rarely less than 101° F. (38.3° C.), even in the mildest. The pulse is rapid and of high pressure, the rapidity being disproportionate to the temperature. This pulse disproportion is almost never absent in scarlet fever, and it represents an important element in diagnosis. The pharynx will early exhibit some soreness. There may be little objective disturbance, yet usually there is marked redness over the fauces and tonsils, consisting of a uniform blush or a series of small punctate spots less marked than in measles; at other times the throat resembles follicular tonsillitis or even a well-marked attack of diphtheria. The enanthem also appears on the soft palate. These throat symptoms are not always obvious at first; more commonly they show a little later in the disease—two or three days—and tend to increase in severity to the point of much distress and greatly puzzle the physician. Diphtheria is suspected, but bacteriologic study seldom reveals the Klebs-Loeffler bacillus—more commonly the streptococcus. Well-marked instances of the mixed infection are, however, recognized. The deep cervical glands are usually enlarged or soon become so.

The enlargement of the superficial lymphatic glands is a marked feature of scarlet fever. It is present to a more or less marked degree in many of the infectious diseases, and is especially prominent in diphtheria, rubella, and scarlatina, and may be merely a characteristic phenomenon of these disorders. Adenitis is more commonly marked among children

than in adults. In scarlet fever the adenitis occurs from the first, and is more marked in the earlier stages, and subsides slowly toward the end of the attack. The enlargement of the glands about the jaw and neck is more or less proportionate to the intensity of the throat involvement. The tonsillar and posterior cervical glands are the ones which most frequently suppurate. In the adenopathy of diphtheria there is a wider variation and a greater lack of uniformity than in that of scarlatina. "As a diagnostic aid in differentiating the rashes of diphtheria from scarlatina, a well-marked enlargement of the superficial glands, especially the epitrochlear and axillary, would, in doubtful cases, I think, lead one to throw the balance in favor of scarlatina" (Schamberg).

In scarlatina all the lymphatic structures of the body are hypertrophied and there is a hyperplasia of the lymphoid tissue of the spleen, liver, and intestines. Patients with high temperatures and well-marked eruptions are apt to have a more marked adenopathy than those with but little fever and poorly marked rashes.

The urine is generally lessened in amount and of higher specific gravity, deeper color, and frequently shows traces of albumin. After three or five days all these symptoms generally subside, and the child becomes bright and active once more, unless some complication impairs its vigor. It is imperative to keep it in bed, however, as exposure to chill at this stage is exceedingly perilous and liable to be followed by serious organic disturbance.

The tongue of scarlatina has been described as typically like a strawberry, that of measles like a raspberry. It is difficult to find such simple, graphic pictures, however, nor do they help materially in diagnosis. A most important and characteristic symptom of scarlet fever is the enlargement of the filiform papillæ at the tip and edges of the tongue. This may be slight and overlooked, but it is constantly present. There are two varieties of this: in one the papillæ have the appearance of small grains of Cayenne pepper sprinkled on the tongue; in the other the papillæ protrude like little buttons, much elevated, but not deeply red. The "strawberry tongue" is an exaggeration of this condition. There is a great deal of confusion in the literature and consequently in the mind of the student concerning the appearance of the strawberry tongue. M. Howard Fussell has done much to clarify this subject. Early in the disease the tongue is very heavily coated with a whitish fur except at its tip and margin. Through this coating, however, the hyperplastic filiform papillæ show prominently. The appearance is not unlike that of a white raspberry. In from forty-eight to seventy-two hours the

tongue desquamates, leaving its whole dorsal surface beefy red, studded with the enlarged and still more intensely red papillæ. ' latter truly presents the appearance of a strawberry. We believe the latter term should be applied to this appearance alone. ' symptom appears very early in the disease and may continue for tw or thirty days.

After the first evidence of disturbance the rash may appear in h day to a day and a half, or even as late as the fifth. It usually be about the neck and chest. It may come and go, and at first esc attention, and continues from three days to a week. In an epidemi observed and reported, occurring in the Children's Hospital in 187 eleven cases, in none the rash lasted over a week, and in one only a si day. The color is distinctly characteristic, a bright scarlet, deeper t Rötheln, but not the crimson of measles, which is more blue in t Color alone is a significant guide to one of keen color-sense, but s one man in ten is bereft of this, and few men (though all wo possess the faculty, this depending for a decision upon comparisor shades and tones is too often only a following of precedent, and no production of observation. There are many irregularities in ap ance and extent of the exanthem: it may be absent altogether, or ap transiently one place to-day, another to-morrow, or may cover the pa from head to heel. Pastia lays great stress upon his "elbow s On the flexor surface (bend of the elbow) a linear striation c tense eruption is usually observed. There may be but one though there are usually several. The lines are scarlet at first, to become purple (even ecchymotic) later, and tend to persi pigmented striæ. They appear early, and last in the pigm stage beyond the eruptive period. He compares this sign to Ko spots in measles, considering it of equal diagnostic value.

The rash of scarlet fever is a punctate dermatitis. The co frequently described as of a bright scarlet or boiled lobster tint. actual color comparison at the bedside such a characterization is to be inaccurate. The color, to be sure, varies within certain li tions in different patients. Upon close inspection the rash is seen made up of small, deep-red puncta, surrounded by erythematous a of a somewhat brighter hue. When these areolæ coalesce, as is us the case, a diffuse eruption is presented. At times, however, there is intervening normal skin, giving the eruption a more or less spe appearance. This is not infrequently noted upon the flexor surfa the forearms, in which region the efflorescence may be so blotchy excite a suspicion of measles. In most well-marked eruptions,

occasionally in mild ones, there are visible numerous pinpoint to pin-head-sized vesicles, with turbid contents. These are for the most part distributed discretely over the abdomen, chest, and, to a lesser extent, upon the extremities. At times they are closely aggregated in clusters, and may even coalesce, with the production of blebs. In rare cases the vesicular element of the eruption of scarlet fever may be so marked as to deceive the physician as to the true nature of the rash. Goose-flesh papules of the normal skin tint, located at the site of the hair follicles, may be present in large numbers in some cases. The favorite situation is the lateral aspects of the abdomen.

The rash of scarlet fever begins upon the neck, clavicular region, and chest, spreading thence over the trunk and extremities. When

FIG. 102.—EXCESSIVE EXFOLIATION OF FINGERS IN SCARLATINA.—(*T. S. Rubues, Minneapolis.*)

the face is typically involved, a characteristic picture is presented. The eruption is limited to the forehead and cheeks, being often heightened in the latter region by a dusky red or violaceous flush; the upper and lower lips are exempt, their pallor strongly contrasting with the surrounding rash. (Circum-oral pallor.)

The rash of scarlet fever varies greatly in intensity, at times being so slight and transitory as to be scarcely recognized, at other times being so intense as to be accompanied by swelling of the cutis and exaggeration of the natural furrows of the skin, or by hemorrhage into its structure.

The eruption fades in from two to eight days, and is followed by desquamation. This usually commences upon the seventh or eighth day, but often as late as the tenth, and may continue for six or seven weeks.

desquamates in lamellæ or strips of considerable size, and, i
rare cases may be exfoliated as an entire epidermal cast of the
(See Fig. 102.) The amount of desquamation is, as a rule, p
ate to the intensity of the eruption. In very mild rashes,
scaling may only be visible upon close scrutiny of the skin.

When at the height, too, sometimes the rash recedes-
in,"—producing a disturbance in the minds of the family an
This is rarely a cause for anxiety; it may, however, indicat
vascular tension, weakened heart action, and is usually rest
the rash and cardiac action, by a hot bath or pack. Second
indicate grave conditions and deserve further study. Th
sometimes nodular or papular, causing an appearance lik
flesh," or vesicular. It may come and go intermittently;
may coexist; occasionally minute hemorrhages appear on th
causing an appearance of "blackness" or, rather, a deep p
is common in malignant cases, but is not constant. Congest
or inflammatory disturbances of internal organs have a
to modify the character of the rash, lessening it, as a rule.

Itching is sometimes annoying, but not so intense as ir
As the rash develops, other symptoms increase and then le
its subsidence. As the rash fades, desquamation sets in;
sists of an exfoliation of dead epithelium, and the form is cha
If the surface has been anointed by soothing applications and
bathed, this is far less conspicuous or prolonged.

It is a common experience in dispensaries, and occas
private practice, to meet cases of the various complications—

dromes, and well-marked symptoms, temperature 105° F. (40.5° C.), "boiled lobster" rash, longer duration (five to seven days); and, finally, **the malignant cases,** with short incubation, intense initial symptoms, early and full exanthem, higher and longer fever, severe and varied complications, intense angina, congestion and ulceration, sores on lips and teeth, cervical lymphadenitis with brawny cellulitis, fetid nasopharyngeal catarrh, and general septic symptoms. In these cases the temperature leaps up and remains high for a week or ten days. We had a notable case, a boy of twelve, presenting all these phenomena, until the dyspnea and heart failure compelled us to abandon hope; the urine was loaded with albumin and growing scanty. Suddenly the urine became loaded also with uric-acid crystals (which was beyond all previous or later experience in acid urines), and continued thus for two days, during and after which all the danger-signals were lowered and the boy made a perfect recovery. To-day, fifteen years later, he is apparently in perfect health.

In severe epidemics there are met with rare instances of sudden overwhelming severity, "*fulminating*," or lightning cases, in which death takes place before the recognizabe symptoms declare themselves. There are usually evidences of cerebral disturbance—vomiting, convulsions, headache, and the like—followed quickly by evidences of organic failure and it may be of hyperpyrexia (107° F.—41.6° C.)

The heart should be carefully examined. Sometimes endocardial murmurs are heard, disappearing entirely. Endocarditis or pericarditis occasionally arises alone, or in connection with other complications The lungs are not often affected, but bronchitis, bronchopneumonia, or pneumonia is present at times.

Surgical scarlatina is a curious condition not well understood, wherein after burns or slight operations scarlatina becomes inoculated. This is usually from accidental exposure in one not protected by a previous attack. The operation seems to render the subject peculiarly susceptible. This form of scarlatina is generally atypic: short incubation, non-characteristic rash, irregular but severe nervous phenomena, are common. Some observers deny that these manifestations are aught else than peculiar forms of septicemia, but it is demonstrated that from them scarlatina is often spread, and that the sequelæ common to this disease follow, such as nephritis and otitis.

The urine in scarlatina is generally lessened in amount, of higher specific gravity and of a deeper color, frequently showing traces of albumin. The kidneys are, next to the throat, most commonly affected —in the milder cases only temporarily, by the appearance of febrile albu-

minuria, which is, according to Delafield, an acute degeneration of th kidneys, direct irritation of the epithelium of the tubulesby the toxin eliminated by the kidneys. The microscope shows a granular degen eration and death of the epithelium of the tubules. It is the appearanc known as "cloudy swelling." This condition entirely clears up upo the recovery of the patient, and calls for no further treatment than continuance of fluid diet. This is not the true scarlatinal nephrit (glomerular nephritis, diffuse nephritis), as that does not usuall appear before the third week of the disease. Pronounced lessening the amount of urine is of grave import.

Rachford states that the blood in this disease exhibits the findin of a secondary anemia. Between the second and eighth days, the is a leucocytosis of from 18,000 to 40,000. The polymorphonucle cells are in excess. The mononuclear cells are increased relative and absolutely later on. As the toxemia subsides, the eosinophil are increased.[1]

Bauer and Deutsch, studying the condition of the stomach in t infectious fevers, found in scarlatina that the free hydrochloric ac is usually absent until after the temperature had fallen to normal f six or seven days, though in some cases it was present at the beginni of the fever, absorption being augmented somewhat, the mobil remaining normal. Slight transient paralyses have been not (Meyer, Alexieff).

Complications.—The most prominent complications of scarlati are observed in the throat. There is almost always present, as constant factor, an erythematous blush, somewhat punctate, spre

[1] NOTE. Döhle of Kiel (Centralblatt fur Bakteriologie, Nov., 1911) found "inclusi bodies" in the polymorphonuclear cells of the blood of 30 scarlet-fever patients. Kretch of Strassburg verified these observations, and suggested that streptococcus infection responsible for the leukocytosis and the "inclusion bodies." Nicoll and Williams m an interesting study of 115 scarlet-fever cases and a number of controls. They found Manson stain most valuable, the red corpuscles appearing bluish green, the nuclei of whites deep blue, the cytoplasm of these cells faint blue, and the "inclusion bodies" a sh between the last two. In fresh cases of scarlet fever, they found from one to six bodie every leukocyte. These bodies tend to disappear in a week or less. They failed to them in only 16 cases, and with four exceptions (one a doubtful case, one other, fulminat the patients had been ill for more than 7 days. The bodies were not found in nor blood. They were detected in one case of syphilis (out of 6 examined), in 8 cases of sipelas, in one case of empyema, in 4 cases of typhus fever, and 7 cases of sepsis (no puerperal). They were absent in measles, German measles, antitoxin rashes, toxic ra of various sorts, diphtheria, and dermatitis exfoliativa. In other words, the absenc these bodies in most of the diseases liable to be mistaken for scarlet fever is striking, should make the blood study of value in doubtful cases. When sepsis is present, these bo will not serve to differentiate the condition from scarlet fever (Nicolls-Archives of Pediat June, 1912).

over the mucous membrane, hard palate, and upon the tonsils, which are swollen, and small, membranous-looking exudates are seen on them, which are easily wiped off. When this angina is severe, the appearances closely resemble diphtheria: so much so that many yet regard this state as a combination of the two diseases, but it is proved by bacteriologic studies to be due to the streptococcus (pseudodiphtheria), and only very rarely to the Klebs-Loeffler bacillus. Late in the disease, after the subsidence of the primary fever, true diphtheria may also coexist. The scarlet fever patient is particularly susceptible to diphtheria.

Should this membranous condition, from whatsoever cause, become severe, the local dangers are from extension along the mucous membrane of the nasopharynx and Eustachian tube to the middle ear. Swallowing is made difficult and painful; the breath is fetid; irritating discharges exude from the nose and throat; respiration is impeded, and the larynx is so narrowed by obstructing membranes as to imperil life directly. Along with this the glands of the neck are invaded, a dense cellulitis is set up, often extending from ear to ear. Sometimes the angina Ludovici may actually appear. Constitutional symptoms are severe, too, owing to streptococcus toxemia or to suppuration in the glands, pneumonia, or nephritis. In the very worst cases gangrene may set in, causing extensive loss of tissue, or, along with a profound increase of the aforesaid symptoms, the membranes become darker and dirtier looking, sloughing takes place, often extensive, involving the blood-vessels, so that fatal hemorrhage may result.

The accompanying constitutional features are shown by increments of intensity of all bad symptoms, profound asthenia and cachexia, with little or no tendency to repair.

The cervical lymph-nodes are swollen in almost all cases, especially when accompanied by severe throat trouble, which may remain as merely an acute inflammation or proceed to suppuration. A cellulitis of the neck may accompany, especially toward the end of the first week. This should be relieved early by free incision, or it may extend to the deep tissues and involve the blood-vessels, hence producing hemorrhages. A marked leukocytosis is usually found when suppuration sets in.

The ears, so commonly involved in scarlatina, are affected by extension along the Eustachian tube from inflammation in the throat. The disease is responsible for 10 per cent. of chronic deafness. It occurs in younger children, and varies with the character of the epidemic, yet in some severe ones the feature is often rare. Otitis arises

at the height of the disease or during convalescence. There may then be pain, high fever, and recognizable deafness, or otitis may be accompanied by no special subjective symptom, and only give evidence by pyemic states or meningitis. The exceptional rise in fever which usually accompanies this falls promptly when the drum ruptures.

The nervous system is rarely affected in scarlatina further than is shown by the convulsions and vomiting of onset. Meningitis may follow severe otitis, by extension, or it may occur in septic cases or as a complication of scarlatinal nephritis. The digestive organs are disturbed, as in other febrile processes. The vomiting of onset is rather an evidence of systemic poisoning than a local disorder, or it may point to cerebral complications. Its occurrence late in the disease may evidence uremia. Among the other complications which are occasionally met with in scarlatina may be mentioned hyperpyrexia, endocarditis, pericarditis, pneumonia, suppuration of the lymphatic glands ophthalmia, and a peculiar form of arthritis which closely resembles rheumatism.

The most feared and most common complication is scarlatinal nephritis. This characteristic complication rarely occurs until the end of the second week. Its onset is usually marked by diminution in the amount of urine; even anuria, subfebrile or febrile temperature; headache, backache, interference with vision, and other symptoms of uremia. Early recognition usually means a good prognosis. Unrecognized cases may die of uremia, or may pass over into cases of chronic parenchymatous nephritis. The urinary finds have been described in the section on nephritis.

Scarlatinal arthritis, in our own experience, is usually seen in two forms: The first form is seen relatively early in the disease. The signs of inflammation jump from joint to joint, and the joints commonly invaded are those affected in acute articular rheumatism of adult life. These cases also respond to salicylates. Open to question, as that term may be, we still designate this affection as scarlatinal rheumatism. The second form of arthritis affects one or affects several joints. It is obstinate, and rarely, the involved joints go on to suppuration. It is unquestionably a septic manifestation, and appears late when other streptococcic complications are manifest.

The influence of the scarlatinal poison on the heart is a very marked one. Mitral systolic murmurs are most common; a "bruit de galop" is occasionally heard; irregularity of the heart action is not uncommon. Endocarditis and pericarditis are occasionally met. The area of dullness is often increased; rapid dilatation also sometimes occurs. Tran-

sitory murmurs are often heard. The heart muscle loses its tone, and is unable to contract sufficiently to close the valves tightly, and from this condition the murmur may come.

Relapses and recrudescences occur somewhat rarely; though, as mentioned previously second attacks are very rare. A true relapse shows itself in from thirty-five to forty days after the disappearance of the exanthem (McCallom), and would be ushered in by the usual symptoms of the disease. A pseudo-relapse or reversio eruptionis takes place just after the disappearance of the exanthem. A reinfection may take place in about fifty days after the eruption has faded, and is not accompanied by very violent symptoms, as a rule, though death may result.

Diagnosis.—It is often exceedingly difficult to be absolutely certain of the diagnosis of scarlatina in less than two or three days or until the later phenomena appear. Notwithstanding the clear picture ordinarily exhibited of the short incubation, vomiting of onset, sudden and marked rise of temperature to 100.5° or 103° F., relatively rapid pulse, early appearance of erythema and angina, pronounced constitutional symptoms and early appearance of albuminuria, etc., nevertheless there are other conditions which present most of these features at times. Vomiting is rarely absent, though it may be so slight that parents or nurses neglect to mention it unless one's questioning is thorough. The enlargement of the papillæ at the tip and edges of the tongue is said by McCallom to be sufficient to base a diagnosis on in the absence of erythema or rash. The chief difficulties lie in the irregularities in the distribution and character of the eruption, whereas a typical scarlatiniform rash is occasionally due to other diseases—influenza, Rötheln, diphtheria—and also to the ingestion of certain drugs. The diagnosis of a typical scarlatinal rash presents few difficulties, but the atypical forms are most perplexing. Certain forms of antitoxin rash are markedly like scarlatina. Subjective throat symptoms are frequent, but not constant enough to base an opinion upon. Objective throat symptoms are always to be discovered, and are a great aid in diagnosis. "The appearance of a punctate eruption in the axillæ and groins, with congestion of the tonsils and a punctate eruption on the roof of the mouth, no matter whether there is any eruption anywhere else or not, are positive proofs of scarlet fever" (McCallom).

To make a diagnosis after the eruption has faded or changed is often most important. A white line at the junction of the pulp of the finger with the nail, showing the commencement of desquamation, is of great significance.

The disease must be carefully distinguished from diphtheria (with toxic rash, etc.); from Rötheln, particularly of the scarlatiniform type (Duke's fourth-disease); from certain cases of measles; from toxic rashes; from dermatitis exfoliativa, and from lacunar tonsillitis (see respective sections). Few diseases are easier to diagnosticate than the typical case of scarlet fever; but no infectious disease may present greater diagnostic difficulties than the aberrant case of this disease. As a rule success lies along the line of order and plan in one's diagnostic inquiry: 1. What contagious diseases has he had previously? 2. To what has he been exposed? 3. A careful elicitation of the prodromes. 4. A careful examination from top to toe. (See Physical Examination, etc.).[1]

Prognosis.—The prognosis in scarlet fever is favorable when cases are carefully isolated and judiciously treated from the start. The severity of the infection varies widely in different epidemics, and in different years under somewhat similar circumstances, from a fraction of 1 per cent. to 25 per cent. or more. In all severe cases, especially with marked albuminuria, the prognosis should be guarded. The kidneys may suddenly cease to act, whereas they had showed previously no evidences of deficient or disordered function. Profuse diarrhea is always a grave symptom. The hemorrhagic form is very serious. Malignant cases (possibly 3 per cent.) nearly always die. Streptococcus infections play an important rôle in the fatal results later in the disease.

Treatment.—The preventive treatment of scarlet fever is by far the most important, and is more practicable than in any other exanthem, because the infectious principle, although most tenacious of life, is not so active as that of some other diseases. Strict quarantine is particularly efficacious, and thorough cleansing and exposure to sun, light and air day and night will usually destroy the focus of disease. Isolation, with proper precautions, is entirely effective in this disorder. A room should be chosen which can be isolated (see Diphtheria). If this is impossible, keep the child in the same one in which the infection first showed itself, and do the best practicable. The care of the room is of the first importance: every movable object should be taken out except those absolutely needed. Temporary curtains of sheets wrung out of antiseptic solutions (Labarraque's or bichlorid) may be hung in front of doors. The dresses of the attendants should be washable, and

[1] NOTE: Umber has suggested a chemical test for scarlet fever, the value of which remains to be ascertained. The test solution is prepared by titrating in a mortar 30 grams of concentrated hydrochloric acid and 2 grams of paradimethylamidobenzaldehyde, and diluted with 70 c.c. of water." Two drops of this solution are added to a small amount of urine. "This will bring about a red coloration, sometimes in the cold urine sometimes in urine boiling." (Tyson and Fussell.)

their hair protected from contamination by a close-fitting caps. The physician should never enter the sick-room without extreme precautions, and should be specially attired. The room should be exposed to the sun and kept cool and airy, provided with, if possible, an open fireplace, the temperature, at first, 68° F. at the head of the bed; later, cooler if fever is high, or warmer if complications arise. The body of the patient is the better for constant anointing with boric ointment, which should be wiped off afterward and will thus assist in cleansing as well as disinfecting, and prevent the spread of the epithelial scales during the process of desquamation, which are so highly infectious. This should be supplemented by daily spongings of the surface in tepid water, to which it is well to add green soap. Recent observers report excellent results from rubbing the body three or four times a day with oil of eucalyptus or 5 per cent. ichthyol. (For further remarks on disinfection of the room and clothing see Diphtheria.)

In the prophylaxis of the individual it is especially important that the throat receive attention, not only of the patient, but of all others exposed to the infection. In the patient it seems probable that an ill-conditioned nasopharynx is the instrumental cause of additional infection, hence complications. This should receive almost the first and constant attention, by means of saline and antiseptic washes and applications.

Scarlatina is a self-limited disease, and no remedy controls or arrests. The bowels require the first medication, and it is particularly wise, as Jacobi urges, to use, in the very beginning of the disease, moderately laxative doses of calomel, and to repeat the use of calomel on the first appearance of nephritis. The diet should be carefully limited to milk and milk preparations, light soups, and broths, although there may be permitted, as soon as the fever subsides below 102° F. (38.8° C.), moderate amounts of starchy and other foods. The general treatment of scarlet fever is an intelligent expectancy, watching the symptoms with a critical eye. The system is laboring under an intense poison, which cannot be artificially eliminated. If the rash does not come out adequately on the skin, warm or hot baths to the entire surface or only the feet should be employed, or possibly, the wet-pack or mustard bath, with the internal use of hot drinks or febrifuges, such as the solution of ammonium acetate, alone or with citrate of potassium. For high arterial tension aconite is the safest remedy, repeated in drop doses every quarter or half-hour, and then at lengthening intervals, along with the saline diuretics mentioned previously. If cerebral symptoms appear, it is well to give several doses of calomel and a mixture of bromid of

sodium with chloral hydrate, or even Dover's powder or other opi especially codein. If this is during hyperpyrexia, coal-tar antipyre and brandy work happily, provided cold applications are insufficie Disturbances of the digestion are not particularly common: vo iting is occasionally troublesome at first, for which bismuth pr arations along with small doses of calomel are useful, given dry on t tongue, or, for younger children, bismuth in solution, along with t aromatic waters, as the equal parts of chloroform-, cinnamon-, a lime-water. Diarrhea may be controlled by very much the same m sures, to which may be added a little paregoric, Dover's powder, or c bolic acid in minute doses. The cervical adenitis, so distressing appearance, is to be best controlled by local cleansing of the nose a nasopharynx, and by applications of cold or lead-water and laudanu rather than by the time-honored officious medication, by iodin, musta ice bags, etc., externally applied.

Rheumatism, or that arthritis which very closely resembles it, i frequent and early complication, appearing often within the first we and is controllable by the salicylates, combined, if very painful, w small doses of acetanilid, phenacetin, or the other coal-tar analges The affected joints should be wrapped in cotton-wool, with m applications of some alkali or methyl salicylate. This may be c plicated by endocarditis or pericarditis, which demands extra caution and appropriate treatment. (See Endocarditis.) The joi which become more seriously affected, usually later in the dise should be carefully immobilized. If there is evidence of pus in joint (pyoarthrosis) a surgical consultation, and prompt surg measures for relief should be sought. The lungs are not so freque affected as in measles; nevertheless they occasionally suffer. heart, as in all infectious processes, demands the most solicitous wat ing. The most serious complication of scarlet fever is nephr This varies according to different epidemics, and also with the amo of care the patient gets from the first. Probably the worst cases a from mild attacks of the fever, which frequently escape detection, hence for which insufficient precautions are used. Rest in bed absolutely essential to safety, as only thus can a uniform temperat be maintained over the entire skin surface. The urine should examined daily from the first, and also long after the child has b allowed to get up and be about. Should albumin appear, the u become scanty, or the limbs dropsical, every effort should be direc to encouraging the action of the skin and intestines, which m then assume part of the functions of the damaged kidney. W

is the great diuretic, especially a bland water free from salines, and the child must be induced by various devices to consume as much of this as possible. All sorts of innocent things may be added to water for this purpose, making it as attractive as possible.[1] The skin must be excited by baths, warm and gradually heated from 95° F. (35° C.) up to 100° or 105° F. (37.7° to 40.5° C.); or by the wet-pack, and, again changing these, if depression sets in, to hot-air baths and foot-baths. Ichthyol, 5 per cent. in lanolin, is extolled as an antiseptic application. Of medicines, pilocarpin stands at the head, from $\frac{1}{50}$ to $\frac{1}{13}$ of a grain, also the acetate and citrate of potassium, made agreeable by lemon-juice or other aromatics. Cathartics are often required, such as calomel or the compound jalap powder, but may become dangerous, depleting the blood and weakening the heart. Locally, poultices do service. Dry cupping has its merits, too; also stimulating liniments and local wet-packs. Later, if anemia is apparent, a well-matured tincture of the chlorid of iron is an efficient remedy, alone or added to dilute phosphoric acid, or iron in the form of Basham's mixture may be used.

Cerebral complications, restlessness, continued convulsions, insomnia, and delirium are in a great measure the result of the intensity of the febrile movement, and in a sense are the criteria of the severity of the disease. These are best controlled by the water applications—baths, packs, etc.—and if continued, by cold to the head—a good way is to hold the child's head over the side of the bed and pour cold water on it. Convulsions may be evidences of uremia.

Malignant cases demand powerful stimulation with ammonia, whisky, caffein, camphor in sterilized olive oil, and musk, along with strychnin. Alcohol may act as a useful tranquilizing agent.

The throat is constantly an object of solicitude. In almost all cases is seen the characteristic macular eruption on the pillars of the pharynx, posterior walls, and uvula. Here antiseptic and astringent solutions are of value to relieve symptoms.

M. Roger, Huber, and Blumenthal have recently reported good results from the injection of serum from convalescents. Gordon reports good results from antistreptococcic serum. In all malignant cases and in those suffering from later septic complication we earnestly advise the free use of antistreptococcic serums (from 20 to 80 c.c. per diem).

[1] Wilson contends that chloral hydrate, administered from an early period lessens the likelihood of scarlatinal nephritis.

MEASLES

Synonyms.—RUBEOLA; MORBILLI, MASERN, ETC.

Measles is an acute infectious and highly contagious characterized by fever and nasal, laryngeal and bronchial cata by the appearance of a distinctive maculopapular eruption on and other portions of the body surface. It occurs in wide-spr demics of variable virulence and extent, recurring every two eighteen months. Its spread is so rapid and universal that di epidemic few of the youthful members of a community that immune escape. It is especially noteworthy that in communiti have been free of epidemics for a long period the course of the d marked by great fatality; for instance, the savages of New I were decimated in a remarkably short time by an epidemic of originating in a mild case of an English sailor on board a tradin In civilized regions, however, where the disease is frequent, the n is relatively small, practically nothing among the children of the do, whereas the poorer and badly nourished children of lowe suffer more seriously. Age seems to prescribe no limit to ar though nursing babies usually escape.

The incubation period may be as long as fourteen, even twe days, ten or eleven being the average, the invasion of three to f presenting symptoms of an acute coryza. Measles is most hig tagious, and it is said the disease may be "taken" from anothe time after the moment of the inception of the infection. T tagium, however, does not cling to objects so tenaciously nor s does that of scarlatina; indeed, after desquamation and possibl the end of it the virulence ceases.

Etiology.—Measles is due to a specific micro-organism probability, but it has not yet been isolated. Whatever t tagium is, it is most active and more readily attacks those unp by previous infection than the poison of scarlatina, but is not cious nor so long lived.

The medium of contagium is presumably the nasal and b discharges, the breath, and the tears. It is communicable by th a short distance. It is rarely carried by a third person or by

Though a disease distinctly of childhood, yet it often attack and produces grave conditions and complications, even w individual has already had or is supposed to have had the Camp measles, among troops, is a dread disease. Repeated of measles do occur, though this is doubted by competent ob

Many other conditions strongly resemble measles, notably the rashes of influenza and rubella. Children at the breast seldom contract the disease, or if so, it affects them very mildly.

Pathology.—Investigation has thus far thrown but little light on the morbid anatomy of measles. In the urine and also in the blood-serum and leukocytes micrococci have been found—a fact that argues the need of further researches as to the etiology of the disease. The essential pathologic changes are found in the skin, and in the conjunctival, nasal, pharyngeal, laryngeal, bronchial, and gastro-intestinal mucous membranes. But more important than these are the pathologic changes in the various complications and sequelæ: Thus in the respiratory tract may be found membranous or necrotic laryngitis, bronchopneumonia, croupous pneumonia or caseous (tuberculous) pneumonia. Severe ileocolitis may affect the alimentary tract. Polio-encephalitis and polio-myelitis have both been observed by the writers. Many of the respiratory lesions are dependent upon pyogenococci (strepo- or staphylococci). The relation of measles to tuberculosis is an interesting one. It is highly probable that most cases of tuberculosis following measles are really cases of latent tuberculosis that have been lighted into activity by the measles. Some latent lesion in the body (bronchial glands, etc.) has been stirred into renewed activity, and other tissues have promptly succumbed.

Symptoms.[1]—The first manifestations of the attack are a marked coryza and a hard, dry, and sometimes croupy cough. This cough may exist for a week or more before other symptoms show. A whole day or more before the appearance of the eruption the fauces may be seen to be greatly reddened and injected and covered with a distinct rash. This papular eruption of the fauces is observed in many other infections. Koplik draws attention to certain bluish-white "pearly" spots situated on a red base, seen on the mucous membrane of the lips and cheeks, about on a line with the teeth. These are observed sometimes as early as seventy-two hours before the appearance of the eruption.[2] The

[1] An early sign of measles is recorded by Muenier ("Jour. de Med.," Jan. 25, 1898), which may at times prove to be of practical value, viz.—a loss of weight before any morbid symptoms occur; it is noticeable on the third day of incubation and becomes more marked until the pyrexia and coryza appear; hence it is a sign of the precontagious stage, and is independent of the age of the patient or the severity of the attack. This might lead to early isolation and check the spread of the malady.

[2] To quote the words of Henry Koplik: "This sign is only of value as it appears on the buccal mucous membrane (the inner surface of the cheeks and lips). Any signs, spots, or appearances on the hard and soft palate, the pillars of the fauces, the conjunctiva, are of no value and rather misleading, for signs and spots exactly similar to those described on the hard and soft palate and pillars of the fauces appear not only in measles, but also in Rötheln, scarlatina, and grip, and simple sore throat. The buccal spots, as described by me, appear only in measles, and in none of the exanthemata, and to my

tongue is coated a dusky "raspberry" red, and though supposed to be distinctive, this cannot be relied on. Accompanying the coryza are great drowsiness, headache, redness and watering of the eyes, sharp injection of the conjunctiva, and usually a cough. The throat is often sore, with moderate congestion of the tonsils, fauces, and larynx. The temperature rises in the evening and falls in the morning. A pre-eruptive remission is of rather common occurrence. (It is not unusual to have an afebrile day preceding the appearance of the eruption.) In variola, on the other hand, one sees an eruptive remission; *i.e.*, the fever disappears with the appearance of the eruption. After about four days of these prodromal symptoms the characteristic eruption becomes manifested. It occurs first back of the ears, at the roots of the hair, but rapidly spreads over the face and neck, which is the principal seat of the eruption. It is usually discrete, but may become confluent in severe cases. A bran-like desquamation follows. The rash is so characteristic that in conjunction with the coryza, cough and injection of the cornea a diagnosis of measles should not be difficult, although error is possible in view of the variations which always occur in the eruptive and general symptoms of a specific fever. The erythema consists of groups of dusky red, "crimson" papules surrounded by discs of a brighter red, which offer strong contrast to the intervening spaces of normal skin. The papules are not "shot-like" as they are in most cases of variola. Frequently the papular areas combine to form a crescent, and this crescentic appearance of the group offers a differential point between the rash of measles and scarlatina. (See Fig. 103.) Moreover, the punctæ of scarlatina are brighter red, smaller, and not often raised above the surface. In some serious cases the rash becomes hemor-

FIG. 103.—MEASLES AT HEIGHT OF ERUPTIVE STAGE.—(*Courtesy of Dr. Jay. F. Schamberg.*)

positive knowledge in no other known disease of the mouth or any constitutional affection. They must be looked for in a very strong daylight. They must be seen in the discrete state—that is, small, irregular, rose-colored spots, with a very minute bluish-white speck, just large enough to be visible in the center of the rose area. Patches or yellowish specks must be excluded. We study the buccal membrane by everting it toward the light with the finger or a depressor. We observe the inner surface of the lips also,"

PLATE I

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4

THE PATHOGNOMONIC SIGN OF MEASLES (KOPLIK'S SPOTS).

FIG. 1.—The discrete measles spots on the buccal or labial mucous membrane, showing the isolated rose-red spot, with the minute bluish-white centre, on the normally colored mucous membrane.

FIG. 2.—Shows the partially diffuse eruption on the mucous membrane of the cheeks and lips; patches of pale pink interspersed among rose-red patches, the latter showing numerous pale bluish-white spots.

FIG. 3.—The appearance of the buccal or labial mucous membrane when the measles spots completely coalesce and give a diffuse redness, with the myriads of bluish-white specks. The exanthema on the skin is at this time generally fully developed.

FIG. 4.—Aphthous stomatitis apt to be mistaken for measles spots. Mucous membrane normal in hue. Minute *yellow points* are surrounded by a red area. Always discrete.

—(*From "Medical News."*)

c—"black measles"—an evil sign, particularly where hemor-
s occur from mucous membranes. There is another type of
les, in which hemorrhages take place into the skin lesions, but
ich the patient is not more ill than in the ordinary case. This
ncommon type must not be confused with hemorrhagic or
ck measles." The maximum temperature is usually coincident
the greatest profusion of the rash. The temperature usually
by crisis on the third or fourth day of the eruption. If after
ourth or fifth day from the beginning of the eruption the pyrexia
persists, some complication, most commonly bronchopneumonia,
ld be suspected.

ike all the other exanthemata, measles is apt to vary in respect
to the virulence and character of its general manifestations.
typical case is marked by a higher or lower degree of pyrexia,
ts own peculiar eruption, and by a catarrhal affection of the res-
ory tract. Sometimes one or another of these symptoms may be
tly exaggerated, or, on the other hand, almost totally absent. In the
er cases the eruptions may be quite obscure and the catarrhal
omena slight, while in the more malignant forms the eruption is
er, more "angry," and the bronchitis may develop into a severe
of bronchopneumonia which calls for vigorous treatment on its
account. In these severer cases the eruption is apt to be dilatory
progress, "suppressed" or "struck in," and makes its appearance
regular intervals and on various parts of the body. Frequently
hild has been manifestly ill for several days with bronchopneu-
ia, and then the rash appears on the buttocks, for instance, which
o often the seat of various eruptions in childhood, thus greatly
arrassing a clear diagnosis of measles.

omplications and Sequelæ.—The more serious of the sequelæ
easles arise out of the nasobronchial catarrh and the consequent
mmation of the respiratory passages. As already stated, the
chopneumonia is the most frequent and indeed the most dangerous
plication; membranous laryngitis also not rarely occurs. During
progress of these complications the glands in the neighborhood
e lesion, especially the small mediastinal glands, are apt to become
ved; swelling and induration result, and there gradually sets in a
us degeneration of the gland. In tuberculous children this con-
n often leads to dire results, a latent process becoming a most active

Middle ear disease is another common complication, measles
responsible for 3 per cent. of the chronic deaf. Severe con-
tivitis, keratitis, etc., are fairly common eye complications. Other

tantly ventilated. The bed occupied should have a mattress of hair and be surrounded by a screen; the coverings should be light and only moderately warm. It is the consensus of opinion at the present time that sunlight should gain free access to the sick-room; though the patient's eyes should be protected from bright light. Von Jürgensen, after referring to the classic plea of Bartels for sunlight and fresh air, says: "It should not be left to ophthalmologists to warn against the injurious effects of darkening the sick-room." With the therapeutic employment of red light, we have had much favorable experience. Mild cases require only general hygienic measures suitable for any febrile disease, with strictly regulated diet as to amount and hours of feeding. The tendency is for catarrhal states of the digestive organs to coexist or follow, especially aggravated by coarse articles of diet, overfeeding, or the use of laxatives. The quantity of food should be reduced to that suitable for a younger child, and it may be fed a little oftener than in health, the food being altogether fluid. During the height of the eruption, there is always anorexia, and frequently vomiting. We find it of distinct advantage to withhold food for twenty-four or even forty-eight hours. Milk, the chief item, after this should be more than ordinarily guarded by alkalies and diluents. If gastric irritation sets in at a later period, meat-juices, soups, and egg-water should be substituted in small amount and at shortened intervals. Plenty of cold water is to be allowed, but not in too large drafts at once, preferably administered in a small vessel holding only an ounce or two. If it is well at the beginning to secure a cleansing of the bowels, a simple laxative, such as castor oil or spiced syrup of rhubarb, may be used with caution, but an enema is usually sufficient, because of the tendency to diarrhea. The late Wm. Pepper sounded an important warning against the use of laxatives in the catarrhal (prodromal) stage of measles. There is usually diarrhea when the eruption appears, and there is grave danger of starting an intractible diarrhea by the use of cathartics or even of laxatives. It is well, also, to make sure of skin activity at the outset by giving warm baths, repeated once or twice a day, until the eruption shows itself abundantly on the surface. Throughout the course of the disease it is especially important to watch and treat the catarrhal tendency, which involves the digestive tract, and as has been said, the respiratory organs, the eyes, and the ears. All that has been said concerning the treatment of coryza applies here. (Cleansing of the nose; boric acid compresses for the eyes and a cap to protect the ears.)

If the eruption is distinctly delayed or retrocedes, some compli-

cation is to be feared, and the skin demands stimulation by loca applications, such as heat to the chest, abdomen, and, above all, to th feet and legs, which last may be sufficient. If the difficulty is ver marked and inflammation of the internal organs is feared, hot bath or packs and stimulants are required. At the height of the eruptio the temperature may rise to 105° F. (40.5° C.) without aggravatin the other symptoms or signifying anything serious, unless undul protracted, when cool baths should be employed at 90° or 95° F. ever three hours and for half an hour. If the cool bathing seems to pro trate, it is well to follow it promptly by alcoholic stimulants and exte nal heat. Quinin is the safest antipyretic, preferably given by su positories, two to four grains every four hours for a child of ten; o grain for a child of two. Coal-tar products should never be used reduce temperature, though we quite agree with certain authoriti that small doses of phenacetin may relieve nervous symptoms. Fe medicines are required: For the fever, solution of ammonium aceta or, if the cough is troublesome, solution of potassium citrate, eve two or three hours, to which may be added syrup of ipecac, five ten drops, or ten or twenty drops of paregoric, or both. If the bronchi catarrh is moderate, it may be let alone; if severe, or if bronchopne monia sets in, the treatment should be prompt and efficient—careful applied counterirritation to the chest, and stimulating expectoran as described elsewhere. Most efficient, in the majority of cases, a inhalations of medicated steam. It is our custom to employ in t apartment:

℞. Creosote,
Ol. eucalypt. ..... āā fl. ℥j
Spt. terebinth. ..... q.s. ad ft. fl. ℥iv
M.
Sig.—Add fl. ℥j to a pint of boiling water and permit the steam to perme the apartment.

(See Bronchopneumonia and Pleurisy.) For the eyes a cleansi wash, such as boric acid, fifteen grains to the ounce, to which may added, in extreme photophobia, half a grain of cocain. The na and pharynx, if markedly catarrhal, may be cleansed by the sa means, and subsequently applications made of glycerol of tannin acetate of zinc. Great care must be exercised during convalescen and attention given to conditions of bronchial and other catarr Should otitis media occur it should be dealt with promptly. (S Diseases of the Ear.) Skin-cleansing should be careful and thorou and during the process of desquamation soothing ointments are

value, of which boric acid ointment is among the best. If the itching is great, to this carbolic acid or resorcin may be added, but carbolic acid is not altogether safe, especially over very large surfaces. Malignant measles requires powerful stimulation and abundant tonics, especially quinin, digitalis, hypodermatic employment of camphor in olive oil, carbonate of ammonium, and mustard baths, along with brandy or hot coffee.

During convalescence the patient should be given tonics, and these should be continued over a considerable period of time. Whenever possible the city child should be sent to the seashore for a short sojourn. Children of the phthsical or scrofulus type demand special attention.

RUBELLA

Synonyms.—GERMAN MEASLES; RÖTHELN

Rubella is a very mild member of the group of infectious fevers, characterized by a slight rash and a condition of general malaise lasting for a few hours or two or three days. So far as external appearances go, the disease would seem to be of a somewhat variable character, possessing points of similarity to both measles and scarlet fever. It is, however, a separate entity, as an attack of rubella does not protect either from measles or scarlet fever, nor does an attack of either measles or scarlet fever confer immunity against rubella.

Etiology.—The origin of rubella is no doubt bacterial, and there are those who seek to account for its frequent resemblance to measles and scarlatina by holding that its cause is a hybrid product of the infectious principles of these two more malignant affections. There may, indeed, be some truth in this, though it lacks scientific confirmation.

The disease occurs usually in epidemics, although sporadic cases may be found. It is of somewhat rare occurrence, does not always admit of unquestioned diagnosis, and demands great attention, owing to its unfortunate resemblance to the two more serious diseases before mentioned. Rubeola and rubella bear practically the same apparent relation to each other that exists between variola and varicella. Much harm results from a hasty dismissal of alarm by pronouncing an ailing child a case of "merely German measles," while in reality the child is suffering from measles or scarlet fever, very serious diseases and accompanied by damaging complications and sequelæ. Occasionally the disease attacks adults. One attack engenders a degree of immunity, but an evidence to its own right to a place among the specific

wide-spread, almost universal enlargement, quite different from the more localized adenopathies of scarlatina[1] or diphtheria. Measles shows relatively little; in scarlatina the glands and interglandular tissue below the jaws are the parts more commonly affected.

The **prognosis** is most favorable. Complications are rarely seen and in very severe cases only.

Diagnosis.—In epidemics there should not be so much difficulty in establishing a correct diagnosis. In isolated cases mistakes are liable to occur, and rubella may be mistaken for any of the erythematous affections so common to childhood. The rash varies so widely in appearance that this alone can not be relied upon as a guide. Inasmuch as there is no positive characteristic symptom of rubella, there is often much confusion in properly differentiating rubella from measles. The rash of measles appears after the fourth day of prodromal symptoms, while in rubella there are practically no prodromes. The presence of Koplik's spots will aid in the decision materially, as they are not found in rubella. On the other hand, Forcheimer has described a characteristic enanthem in rubella, closely resembling the exanthem and appearing principally upon the soft palate. In scarlet fever the rash is usually preceded by malaise, vomiting, and sore throat. The temperature can always be taken as an important indicator in determining diagnosis. In rubella it is not uncommon for the patient to maintain a normal temperature, or, at the most, to suffer only a slight febrile rise.

Treatment.—Rubella requires no particular treatment and possibly no medication, but it should always be borne in mind that an exanthem may not be ignored, and care must be exercised lest some accidental exposure or state of exhaustion reacts unfavorably upon the blood or the vital organs. We have seen many cases of this disease, and some of them caused much concern. During the stage of eruption the bed is the only safe place, or at least a uniform atmosphere in one room. The diet should be exceedingly simple, and large quantities of water should be drunk; the skin should be properly protected, at least until desquamation is completed. There is generally an uncomfortable feeling in the throat, which should be relieved by the antiseptic alkaline spray through the nostrils, followed by vaporized petroleum, to which some aromatic may be added, as camphor or menthol. Conjunctival irritation is sometimes present, when an antiseptic wash may be needed, as boric acid, fifteen grains to one ounce of distilled

[1] Schamberg has shown that many glands may be affected in scarlet fever, so that this distinction does not always hold.

water, and if there is pain, a small amount, as from one-half t grain, of cocain may be added. The bowels should be kept

VARIOLA

Synonym.—SMALLPOX

Variola is an acute infectious disease, characterized by a su onset, severe frontal headaches, lumbar pains, and abrupt fever, falls to normal or nearly so upon the appearance of an eruption to rise again when suppuration occurs), which passes throug stages of papule, vesicle, pustule, and crust. It is now seldom se civilized countries, being entirely under the control of vaccin

Etiology.—Smallpox is one of the most virulent of the conta diseases, and it is in all probability due to a micro-organism, alth the specific cause or germ has not, as yet, been isolated. The gium is contained in the secretions and excretions, the exhaled ai the pustules, and may remain dormant for a long time in clothi other objects.

Unless protected by vaccination or a previous attack of s pox, most people are susceptible. All ages are attacked, from the old to the fetus in utero. Sex has no influence. It is claimed by that the colored race is more susceptible than the white. Sma may be conveyed to a considerable distance through the atmosp Some maintain, and with good reason, that aerial conve (conveyance) may occur for at least a mile. In Philadel neither scarlet fever nor diphtheria were more prevalent i neighborhood of the old Municipal Hospital; but when smallpo prevalent more cases were always observed in its adjoining (twenty-eighth and thirty-second) than elsewhere in the city (W

Pathology.—The *papule* consists of a cellular infiltration c rete mucosum, which soon undergoes coagulation necrosis. A apex of a papule a vesicle is formed, due to the circumscribed in mation and exudation of serum beneath the epidermis. The ve contain serum, leukocytes, and fibrin filaments, and are locu There is also a depression in the center, the so-called umbilic The *pustules* are formed by a filling of the reticuli with leuko When the pustule is confined to the rete mucosum, there is no p or scarring; when it extends through the true skin, pitting inva follows. True "pocks" are found on the skin and also on the b mucous membrane, esophagus, and larynx, but rarely in the sto intestine, or bronchi. In hemorrhagic smallpox there is an earl

travasation of blood beneath the skin, into the mucous and serous membranes, the parenchyma of the different organs, the connective tissue, and nerve sheaths. There are no true pocks found in the bronchi, but bronchitis and bronchopneumonia are frequently associated with the disease, and lobar pneumonia and pleurisy occasionally. The heart is sometimes the seat of myocardial changes, but rarely of endocarditis or pericarditis. Small areas of fatty degeneration are found in the liver. The spleen is enlarged. The kidneys may show a cloudy swelling or even a true nephritis.

Symptoms.—Smallpox is usually divided, according to the severity of the process, into three classes, as follows: (1) Variola vera (discrete and confluent), true smallpox; (2) variola hæmorrhagica, or black smallpox; (3) varioloid or modified smallpox.

The incubation period of smallpox ranges from ten to eighteen days, but by far the most usual time is fourteen days.

The stage of invasion frequently begins in children with a convulsion, followed by a sudden rise in temperature, frontal headache, and distressing lumbar pains. Vomiting is often an annoying symptom and constipation is usually present. The fever rises rapidly, and reaches its height at about the end of forty-eight hours, and ranges from 103° to 105° F. (39.4° to 40.5° C.). With the high fever there are often associated marked delirium and restlessness. Vertigo is an almost invariable symptom if the child is old enough to describe his subjective symptoms. Excruciating headache and pain in the lumbar region are also complained of.

The pulse is rapid and full when the patient is in the recumbent position; but becomes very weak and sometimes dicrotic if the upright position is assumed.

During this stage the preeruptive rashes are sometimes seen. They are either fine, resembling scarlatina, or macular, resembling measles. A frequent situation of the preeruptive scarlatinal rash is the lower abdomen and thighs (forming a triangle). Petechiæ are also noticed, as well as urticaria. These rashes occur in from 10 to 16 per cent. of all cases.

Eruption. (1) *The Discrete Form.*—The eruption begins to appear at the end of the third or the beginning of the fourth day, and is first noticed at the edges of the hair and upon the wrists as hard, shot-like papules beneath the skin. With the appearance of the eruption the fever falls to normal and there is a subsidence of all distressing symptoms. The eruption, after beginning on the face, appears on the rest of the body, and last upon the lower extremities. It is always

thickest upon the face and extremities. Frequently, wh
tion is confluent upon the face, the lesions may easily be c
the body. As a rule then, the eruption is most marked u
of the body not ordinarily protected by clothing—the
of varicella. On the third or fourth day of the eruption
begin to change into vesicles, with a slight depression or
at the center. (See Figs. 104–105.) On the eighth or nin
disease (fifth or sixth of the eruption), the vesicles change

FIG. 104.—DISCRETE SMALLPOX.—(*Courtesy of Dr. J. F. Schamberg.*)

FIG. 105.—DISCRETE
UNVACCINATED GIRL, SE
ERUPTION. (*Courtesy of*
berg.)

They then lose their depression or umbilication, and be
globular in shape and grayish-yellow in color, instead
serum of the vesicles. With the formation of the pustu
rises—the secondary fever—and the skin around the pust
red and inflamed. The face and eyes are swollen, and a
painful. There is ofttimes a return of the delirium wi
sometimes more marked than at first. In discrete small
usually begins to fall by lysis at the end of thirty-si
pustules break and begin to form crusts, and the swelling
that on the twelfth or thirteenth day convalescence
established. In a few days more the scabs begin to fall

The confluent form usually begins with the same s
the discrete form, except that they may all be intensified.
tion appears about the fourth day, either running togethe
tules may coalesce later. (See Fig. 106.) The fever

normal with the appearance of the eruption, and the patient feels quite comfortable. About the eighth day the pustules are fully formed or matured, and the fever again rises to 103° to 105° F. (39.4° to 40.5° C.). With the rise of the fever the delirium often appears. Children are apt to suffer from diarrhea, and complain of great thirst. The pocks may be seen in the mouth, pharynx, and air-passages. This often gives rise to a fetid discharge, and when in the larynx, to huskiness of the voice and sometimes edema of the glottis. At this stage hemorrhage may take place into the pustules, and exhibit a bluish center—a very unfavorable symptom, and is sometimes described as a variety of the hemorrhagic form, or variola hæmorrhagica pustulosa. The face is

FIG. 106.—FATAL CONFLUENT SMALLPOX IN AN INFANT TWO WEEKS OLD.—(*Courtesy of Dr. Jay F. Schamberg.*)

swollen, the eyes are closed and sometimes much inflamed, and the lymph-glands are markedly enlarged. The skin is painful and tender, and the itching is frequently annoying. During this stage delirium, subsultus, and diarrhea are symptoms of bad omen. When recovery takes place, the pustules break about the twelfth or thirteenth day, and crusts begin to form. The fever subsides about the third week; in severer cases about the fourth week. Convalescence is slow and prolonged, as a rule, and patients are frequently tormented with numerous boils.

VARIOLA HÆMORRHAGICA.—Hemorrhagic or black smallpox presents nearly the same symptoms during the initial stage as variola vera, but they are all more marked and severer. Frequently on the second day a hyperemic condition of the skin appears, ecchymotic spots show on the conjunctiva, and bleeding frequently occurs from the mucous surfaces. Death usually results before the variolous

eruption appears. However, the shot-like papules may be f
edges of the hair and upon the wrists.

VARIOLOID.—The initial symptoms of smallpox modified b
tion may be intense, but with the appearance of the eruptio
subside and the patient is practically well. The eruption co
few papules scattered over the body. It runs a shorter a
course, and the crusts separate much sooner than in th
fied variety. Some of the vesicles never develop into pust
as a rule, there is no secondary fever. This variety, howeve
times very difficult to diagnose.

FIG. 107.—SMALLPOX IN THE LATE PUSTULAR AND DRYING STAGES, NINT
ERUPTION.—(*Courtesy of Dr. Jay F. Schamberg.*)

COMPLICATIONS. *Digestive System.*—Vomiting or a
frequently met with early. Swallowing is sometimes diffic
to the swelling of the glands and the lesions located in the t
mouth. Diarrhea is frequently a serious complication. S
lesions in the rectum give rise to symptoms of dysentery.

Circulation.—The pulse is full and rapid, not dicrot
carditis occurs often, but endocarditis and pericarditis are no

Respiratory Tract.—The mucous surface of the upper r
tract is frequently the seat of the lesions, and they give ris
discharges. Pocks in the larynx may extend through th
membrane and cause destruction of the cartilage or give ris

edema. Bronchitis and bronchopneumonia are frequent complications. Lobar pneumonia is unusual. Empyema may occur.

The kidneys may show a febrile albuminuria, but true nephritis is rare. In hemorrhagic cases hematuria is sometimes present.

Skin.—Numerous boils or deeper phlegmons sometimes follow and prolong convalescence.

Eye.—Conjunctivitis is frequently noticed, and unless the eye is kept clean and aseptic, keratitis and iritis may follow, with loss of sight.

Diagnosis.—In typical cases of smallpox the characteristic initial stage, with the headaches, lumbar pains, vomiting, and high fever, together with the appearance of the eruption on the fourth day, which is at first papular, then vesicular, then pustular, makes the diagnosis comparatively easy. In some atypical cases it is liable to be confounded with varicella or chicken-pox. The chief points of difference are as follows:

VARIOLA	VARICELLA
Initial stage marked.	Initial stage absent or very mild.
Eruption appears at the end of third or beginning of fourth day, and is first papular, then vesicular and umbilicated, then pustular.	Eruption appears on the first day as a vesicle and is not umbilicated.
Vesicle is multilocular; the skin or covering is very tough and not easily broken by pressure.	Vesicle is unicellular, and the covering is very thin and is easily broken by pressure.
Vesicle does not collapse when pricked with a pin.	Vesicle does collapse when pricked.
Eruption thickest on face and extremities.	Eruption thickest on trunk, especially the back.
Various stages of vesicle at points removed from each other.	Various stages of vesicle side by side: some are just appearing, while others are beginning to form crusts (multiform characters of the lesions).
Runs course in from five to six days in mild cases, and in ten to fourteen days in severe cases.	Runs course in from two to five days.
Secondary fever, as a rule.	No secondary fever.

Scarlatina and measles should not give rise to any difficulty, and for diagnostic purposes the reader is referred to the articles on those diseases. The eruption of impetigo contagiosa may resemble variola, but the absence of the initial stage and fever and the superficial character of the lesion should make the diagnosis plain. In the prodromal stage, smallpox may be mistaken for rheumatism, lumbago, epidemic influenza or typhoid fever. The appearance of preeruptive roseola on

the abdomen led to the last-named mistake in a number of cases during the epidemic of 1900–1901.

Prognosis.—Prognosis depends on the type or variety which the physician meets. In the discrete form the prognosis is favorable. In the confluent form it is grave, and in the hemorrhagic form is almost always fatal. Varioloid is in most cases followed by recovery. In children, however, it is usually unmodified. Out of the 5000 cases reported by Wm. M. Welch, physician-in-charge of the Municipal Hospital of Philadelphia, Pa., there were 80 cases under one year of age. Of these 80 only 2 had been vaccinated, leaving 78 unvaccinated. The mortality among the unvaccinated 78 was 57, or 73.07 per cent. These figures show the high mortality among unvaccinated children under one year of age, and that smallpox almost always occurs in the unvaccinated. From one to seven years of age: 404 unvaccinated cases were admitted and 208 died, or 51.48 per cent.; of the 35 vaccinated cases 2 died, or 5.7 per cent. Up to seven years of age the death-rate is about 60 per cent. among the unvaccinated. Welch also shows that the mortality is less in those displaying a good vaccination scar than in those with average or poor vaccination marks.

Treatment.—The prophylactic treatment is vaccination, which is capable of causing the ultimate disappearance of the disease as it practically has done in the German Empire. When smallpox occurs in private families, it is earnestly advocated that all patients be sent to a hospital, on account of the extreme difficulty in securing suitable isolation and protection for the public. The general arrangement of the room and thoroughness in disinfecting all articles of clothing, etc., about the patient should be observed, as is advised in the care of diphtheria patients. (See article on disinfection under Diphtheria.) It has been proved, however, that smallpox may be transmitted for as much as a mile by aerial convection. (This has been the experience in Liverpool, of the Hospital Ship on the Thames, and of our Municipal Hospital in Philadelphia.—Welch.)

During the initial stage opium is needed for the pains in the limbs and back. For the relief of the vomiting such remedies as bismuth, pepsin, cerium oxalate, cocain, iced champagne, and bits of cracked ice may be used. The fever should be controlled by the cold bath or cold-water sponging. In administering the cold bath it is advisable to begin with tepid water of 90° or 95° F., and gradually reduce the temperature to 75° or 80° F. For the eruption it is advisable to keep patients in a room with red curtains, and the application of such lotions as a saturated solution of boric acid on lint or weak solutions

of bichlorid or carbolic acid. Emollients, such as cold cream or vaselin, frequently relieve the itching and keep the crusts soft. The eyes should be kept clean with boric acid solutions; also the nares and mouth. Diarrhea is frequently a troublesome symptom, and is best controlled by bismuth and, possibly, a little opium. The diet should be carefully adjusted to the needs of febrile states. For the extreme weakness whisky should be given. Quinin also is indicated, especially during the stage of pustulation, and when the secondary fever is high.

VACCINIA

Synonym.—Cowpox

Vaccinia is an eruptive disease occurring among cattle, which, when inoculated into the human system, produces mild constitutional symptoms and a local manifestation resembling the pock of variola, and confers more or less permanent immunity against smallpox.

History.—While yet a medical student, Jenner's attention was called to the fact that milkmaids in Gloucestershire, England, who became accidentally inoculated with cowpox were immune to smallpox. Many years before this a famous mistress of a notorious king had confidently stated that her beauty could not be spoiled by smallpox, for she had had cowpox. After thoroughly investigating the matter and by numerous experiments Jenner became convinced that cowpox artificially produced in the human system rendered it immune to smallpox. He published his discovery to the world in 1798. Since then vaccination has come to be universally practised in all civilized countries entirely superseding the dangerous method of inoculation, and, as a consequence, smallpox is at the present day robbed of its terrors.

Varieties of Virus.—Formerly, humanized virus was altogether used, but since the introduction of bovine virus it has almost entirely taken its place. Bovine virus is absolutely incapable of conveying syphilis, which rarely followed the use of humanized lymph. Whenever humanized lymph is used, great care should be taken in selecting a child who is entirely free from any syphilitic or other infectious taint. The humanized lymph acts more promptly and is followed by more severe constitutional manifestations than the bovine lymph. When it is desired to get a quick result—as, for instance, in a person who has been exposed to smallpox—it is advisable to use humanized lymph; otherwise bovine is to be preferred.

Technic.—The site for the inoculation usually selected is the arm

at the deltoid insertion, but in females it is frequently requested that the vaccination be done upon the leg for esthetic reasons. It the patient be a baby which has not learned to walk there is an actual advantage in vaccinating upon the leg; but in older subjects a firm stand should be taken against this, for cellulitis is far more frequent in the lower extremity.

The site should be rendered aseptic by scrubbing with soap and water and then rinsing with sterile water. If any antiseptic were employed, it might render the vaccine virus inert. More recently we have used green soap for thorough cleansing; have removed this thoroughly with alcohol, and have then washed carefully with sterile water. It is far better, except in the presence of an epidemic, to fail in securing "a take" than to run any risk of septic infection. After the site has been cleansed, it should be dried with a sterile gauze or cotton, and then gently scratched or scarified with a sterile needle or lancet until the site is bathed with serum. Avoid drawing blood if possible. The technic is the same for both humanized and bovine lymph up to the point of applying the virus.

1. *Glycerinized Lymph.*—Break off each end of the capillary tube and on one end place the small rubber bulb that is always supplied and hold the other over the spot that has been scarified, then press the bulb and force out the virus, rub it in thoroughly, and dry in the air.

2. *Ivory Points.*—Dip the ivory point into tepid sterile water and thoroughly rub it over the place to be scarified for vaccination. Instead of using the needle or lancet to scarify, it may be done with the ivory point. After vaccination the serum should be permitted to dry in the air.

3. *Arm-to-Arm.*—A well-developed vaccine vesicle is selected about from the fifth to seventh day before the areola is formed. Some of the serum is transferred from this and well rubbed in the same way as above. Avoid drawing blood.

4. *Crust or Scab.*—A vaccine crust or scab taken from a healthy child is selected. A small piece is placed between two pieces of glass and thoroughly powdered. To this some sterile water is added enough to make it of the consistence of cream. Then proceed as above.

The vaccination wound must be carefully protected from future contamination by clothing, etc. Our favorite plan of dressing is to take sixteen layers of folded sterile gauze, so as to make a pad 2 × 1 inches square. In this we cut out a circle 1 inch in diameter. The pad is then placed on with the circular opening over the wound

There is no contact. The gauze is fixed in place with narrow adhesive strips. A sterile gauze bandage is next wound around the arm, and its layers are fixed to the underlying pad with safety pins. This dressing is superior to any shield and has none of the disadvantages of shields. Such a dressing is advisable because the incubation period of post-vaccinal tetanus shows pretty conclusively that the infection occurs subsequent to vaccination. The vaccination so done and so protected usually begins to take on the fifth or sixth day. A well developed vesicle with the typical areola is usually seen between the eighth and the tenth day. (See Fig. 108.) With its full development, mild febrile symptoms appear, and there is usually an axillary adenopathy (adenitis). In our experience the vesicle does not usually proceed to the pustular stage. With a successful vaccination the crust should not drop off for three weeks after the operation (Welch). The typical pock-like scar should then be in evidence. At the present day, most authorities are agreed that the vaccine disease in cattle is really a modified smallpox resulting from the production of that disease in a less susceptible animal.

FIG. 108.—VACCINE VESICLE ABOUT SEVENTH DAY, AREOLA JUST BEGINNING TO APPEAR. (*Courtesy of Dr. Jay F. Schamberg.*)

Period of Life.—First vaccination should be done in a strong and healthy child at about the third month. If the child is not strong, it may be advisable to wait unless smallpox is prevalent. The second vaccination should be done when the child has completed its first dentition; the third about the time of puberty.

VARICELLA

Synonym.—CHICKEN-POX

Varicella, or chicken-pox, is a mild, infectious disease of childhood, with slight constitutional disturbance, the chief characteristic of which is a papular rash rapidly changing into vesicles with pearly contents, and always appearing in successive crops. Though quite a distinct entity, it bears a close resemblance in many of its symptoms to a modified form of smallpox. Varicella is distinctly a disease of childhood, few adults and those only who have been nursing or thrown

into intimate and prolonged contact with the patient being attacked by it. Its right to a distinct place in the list of infectious diseases, in contradistinction to its being merely a modification of variola (as is sometimes stated), lies in the fact that varicella and variola do not mutually afford immunity, that variola affects all ages, and that direct inoculation with the virus of variola always produces that disease, and, likewise, varicella inoculation invariably (when the operation is successful at all) produces varicella. The disease occurs in eqidemics, and nearly all children contract it at sometime or another. It usually protects for life against another attack and that is the reason that so few adults have it.

Etiology.—Chicken-pox is due, in all probability, to its own specific germ. It is contagious, and the infective principle retains its vitality for a very short period of time. It may be communicated from child to child by direct contact, and a third person can also be the medium of communication. The period of incubation is variously estimated, a fortnight being the average time. The contagium can be carried through atmosphere for a short distance.

Symptoms.—Before the outbreak of the eruption there is occasionally experienced a feeling of slight indisposition, some headache, vertigo; but no definite premonitory symptoms. Usually the first notice of the disease is the appearance of the eruption itself. When prodromes are in evidence, it is usually for a short time (twelve to twenty-four hours). At or before the period of the eruption there are loss of appetite, weariness, and, as the macules appear, fever, the temperature rising to 101° or 102° F. (38.3° to 38.8° C.). There may also be chilliness, and in very severe cases even convulsions, although they are very rare. Dizziness is common. The eruption appears simultaneously in different parts of the body, beginning, as a rule, in the borders of the face, behind the ears, and in the edges of the hair, and consists in successive crops of rosy papules, not unlike typhoid fever, and small bullæ or blebs, which are of the simple unilocular variety, not umbilicated as in variola, or very rarely so. Most of the lesions are soon noted on the trunk. (See Fig. 109.) The base of the vesicle is inflamed, and there is a slight areola of flushed skin around the papule. The vesicles contain a limpid, pearly fluid which remains fairly clear unless irritated, as by scratching, when it is liable to become purulent. Usually the vesicles dry up in a few hours and a scab forms, which ultimately falls off, leaving a clear unscarred skin underneath. This is the normal termination of the varicella eruption, though it not infrequently

at a scar similar to the scar of smallpox is left behind. The crops of vesicular papules last about a week, although the f is over in half that time. If pricked, the vesicles collapse. r of these vesicles over the body varies greatly, sometimes n number and at other times quickly dispersed over the ; the face, however, having a much smaller number in pro- ther parts.

ations are rare and few in number; but gangrene (vari- enosa), pneumonia and nephritis are at times observed. st complication is usually seen in undernourished institu- ren.

VARICELLA, CHICKEN-POX, SHOWING LESIONS IN THE CRUSTED STAGE.—(*Courtesy of Dr. Jay. F. Schamberg.*)

sis.—As already stated, modified smallpox may be mis- aricella. The principal points of differential diagnosis are

VARICELLA	MODIFIED SMALLPOX OR VARIOLOID
about fourteen days.	1. Incubation twelve days.
symptoms slight.	2. Severe, with high temperature, intense backache, vomiting; all the symptoms of a severe disease.
fever lasts but a few hours.	3. Lasts two or three days.
e-rise slight.	4. Temperature rises suddenly and reaches its height before the papule is fully developed, after which temperature falls. No secondary fever.

VARICELLA	MODIFIED SMALLPOX OR VARIOLOID
5. Rosy spots, macules becoming vesicular in a few hours and drying in three or four days, leaving crusts. Eruption comes out in crops and spots and is not confluent. No pustules.	5. Red, shot-like papules appearing on face, anus, and mucous membranes. In one or two days the papules change to vesicles, and on the eighth day develop into pustules. (The disease is smallpox in a vaccinated subject.)
VARICELLA	VARIOLA
1. Appears chiefly in children.	1. Attacks persons of any age.
2. Duration of disease short, and symptoms very mild.	2. Period of invasion three days; general symptoms severe.
3. Eruption papular or vesicular: never pustular, unless through contamination.	3. The papular stage is longer, and the eruption ends with formation of pustules.
4. The eruption is superficial, rarely umbilicated, not partitioned, multilocular, and discrete.	4. Eruption is deep-seated and has usually umbilicated, the vesicles being partitioned and frequently confluent.
5. Eruption appears chiefly on the trunk, very little on face.	5. Eruption chiefly on face, hands, and feet.
6. Not influenced by vaccination or previous attack of smallpox.	6. Prevented by smallpox, and rendered mild by a previous successful vaccination.

Delicate children should be isolated. Those attacked should be carefully guarded.

The **prognosis** is almost invariably favorable. In unhealthy children, especially those affected with scrofula or tuberculosis, the vesicles often degenerate into ulcers, and these may spread and take on a serious aspect.

Treatment.—Chicken-pox calls for very little treatment, but it is of more importance to insist upon rest and freedom from exposure than is ordinarily taught or practised. While it is perfectly true that children suffering from this minor exanthem are usually permitted to run about and disport themselves much as they like, upon the assumption of the parent or physician that the dangers of complication are small, yet it is certainly true that complications do arise, sometimes seriously affecting organic integrity. A child suffering from chicken-pox should be isolated at least for a week, and kept under uniform and controllable conditions of air and temperature, thoroughly protected from chill, exposure, or undue fatigue, supplied with a simple dietary and with a simple diuretic and diaphoretic medicine. No meat should be allowed for at least a week. The skin is kept in good condition, and much relief is afforded the patient by daily

sponging with a saturated solution of bicarbonate of soda containing 1 percent of carbolic acid. It is our custom to follow this wash by the use of a simple ointment (1 percent of carbolic acid in an ointment of zinc oxide). During convalescence definite control should still be exercised over fatiguing conditions, exposure to extremes of heat or cold, and some attention given to the digestive organs and dietetics. Some poverty of the blood is liable to result from even so slight a febrile process as this, and a tonic, with change of air, should be supplied when convenient or obviously needed.

DIAGNOSTIC TABLE OF THE EXANTHEMATA

Disease	Scarlet fever	Measles	Rubella	Small-pox	Varicella
Immunity.	Usually conferred for life by a single attack.	One attack nearly always protects for life.	Conferred by a single attack.	Usually conferred by small-pox or by vaccination. Varioloid may occur in a protected subject.	One attack immunizes.
Exposure and incubation period.	To sick patient, infected room, fomites or carriers from 2 to 7 days before symptoms appear.	To a sick patient 10 or 11 days before the prodromata appear. The contagium is short lived.	To a sick patient from 13 to 17 days before the disease appears. (More or less.) The contagium is short lived.	To a sick patient, infected dwelling or fomites, or through "aerial convection," 12 or 13 days.	To the sick patient from 14 to 21 days before symptoms appear. Conveyance through a short distance by air.
Prodromes.	High fever, relatively rapid, high-tension pulse, vomiting, sore throat, heavily furred tongue for 12 to 36 hours.	"Croupy" cough, coryza, conjunctivitis, Koplik's spots and fever for 3–5 days. Pre-eruptive, remission in temperature.	Slight rise in temperature, sore throat and cervical adenopathy for 12 hours or more. Often absent.	Chill, high fever, severe headache and lumbar pain, dizziness, sthenic pulse, preeruptive exanthems for 3 or 4 days.	May be absent or so slight as to escape attention. Slight fever, dizziness and malaise for a few hours.
Exanthem and desquamation.	Appears first on chest, neck and face. Circumoral pallor. Punctiform, though diffuse. Scarlet in hue. Lasts 10 days to 2 weeks. Lamellar desquamation for 5 to 8 weeks.	Appears first around ears and hair line and face. Maculo-papular, with crescentic groupings. Fades in 10 days to 2 weeks or less. "Branny" desquamation.	Appears first on face. Macular or more rarely scarlatiniform. Pale rose or pink in hue. Lasts 2 or 3 days. Desquamation scarcely discernible.	Eruptive remission in fever, pains, etc. Appears first on face and other exposed parts. Passes through macular, papular ("shotty"), vesicular and pustular stages. Latter lesions umbilicated. Crusts fall off.	Appears first around hair and on the trunk. Appears in crops. Papules (not "shotty") with pink areola soon become vesicles. Crusts.

DIAGNOSTIC TABLE OF THE EXANTHEMATA—(*Continued*)

Disease	Scarlet fever	Measles	Rubella	Small-pox	Varicella
Complications and sequelæ.	Severe anginas, middle ear disease, severe cervical adenopathies, joint lesions, and scarlatinal nephritis. Nervous sequelæ.	Pneumonia, ear disease, ophthalmic lesions, tuberculosis, severe nervous sequelæ, etc. Noma.	Complications and sequelæ are rare.	Pneumonia, sepsis, meningitis, myocarditis, panophthalmitis, nephritis, furunculosis, etc.	Few complications as sequelæ. Varicella gangrenosa (rare). Nephritis.

WHOOPING-COUGH

Synonym.—PERTUSSIS

Whooping-cough, or pertussis, is an acute infectious and highly contagious disease of early childhood, occurring sporadically and epidemically, characterized by a catarrhal affection of the respiratory tract and a characteristic paroxysmal cough which terminates in a prolonged stridulous inspiration, and often in vomiting. It leaves a peculiar vulnerability of the mucous surfaces of the bronchi and intestines, which should never be lost sight of by parent and physician. It spreads with great rapidity through a community, especially in the cold months, attacking the youngest most readily, and infecting nearly all those not immunized by a previous attack. Such immunity is almost complete, second attacks occurring only as rare and isolated instances. Children who are much in the open air or living in well-ventilated houses escape more readily than when crowded in close quarters. Infection is almost entirely from direct and immediate contact, but the slightest exposure at short range will suffice. Mediate contagion is most unusual. Whooping-cough is an exceedingly fatal disease, ranking in deadliness to infants next to scarlet fever and diphtheria. It affects babes under six months with the utmost readiness, differing from the exanthemata in this respect; indeed, its ravages are chiefly confined to children under two years, and it is of less frequent occurrence above four years of age and comparatively rare after ten.

Etiology.—The essential cause of whooping-cough is most probably a micro-organism, but what this is has not been exactly determined. As early as 1887, Afanasieff discovered a bacillus that he styled "bacillus tussio convulsivæ." He contended that he had produced the disease experimentally with this organism. Eppendorf, Jochmann and Krause, Koplik, Czaplewski, and Hensel and Wollstein have also done good bacteriologic work. They have all found a bacillus bel

ing to the "influenza group." Wollstein "obtained characteristic agglutination reactions with the blood of children suffering with this disease." Other authorities, notably Deichler, have found protozoa in the lesions of whooping-cough patients.

Most recently Bordet and Gengou have discovered a micrococcus, and in favor of its specificity they have made a very strong case. Accumulating pathologic and clinical evidence tends to support their claims. They also found in the blood of affected children an "anti-pertussis sensibilitizer." A bacterin has been prepared from this organism, and is now on trial.

Many contributory causes are recognized, of which the age of the patient, as already mentioned, is one of the chief. A depressed state of health is another, and there is some well-recognized but unexplained relationship between epidemics of measles and whooping-cough which predisposes those suffering with these diseases to contract this specific cough. The presence of any other diseases does not interfere with its acquirement. Some children are never infected, though often exposed; a few cases occur late in life.

Pathogenesis and Pathology.—The immediate cause of the paroxysm of coughing is found in irritation of the mucous membrane of the upper air passages supplied by the superior laryngeal nerve. Inflammation and small hemorrhages have been noted in life by the aid of the laryngoscope. Some contend that the exciting irritation is confined to the posterior portion of the larynx, between the arytenoid cartilages. Still others have observed an accumulation of mucus in the trachea, just below the larynx, and have viewed this as the excitant of the paroxysmal cough. The nose and pharynx share in the catarrhal involvement, and in consequence of fifth-nerve irritation, some children "sneeze" in place of whooping.

In uncomplicated cases, the pathology is probably confined to inflammation of the mucosa and submucosa of the upper air passages and bronchi. The mucous membrane is red and swollen. In a very recent article Mallory and Horner (*Journal of Medical Research*, Nov., 1912) have described the histologic lesions thoroughly. In three different subjects they succeeded in finding the organism of Bordet and Gengou in the tissues. This was most remarkable in view of the fact that one specimen had been preserved since 1897.

In complicated cases, the lungs may exhibit the lesions of bronchopneumonia or of tuberculosis. Bronchiectasis, emphysema and subcutaneous emphysema may occur. Empyema is another occasional find.

In the digestive tract enteritis and colitis may exist.

The heart muscle may be affected as Baginsky and others have pointed out, though little is known of the exact changes.

We have observed acute parenchymatous nephritis.

Hemorrhages may be noted in the nose, beneath the conjunctivæ and into the brain membranes or brain itself. Other nervous lesions are meningitis and polioencephalitis. Otitis media is not uncommon. Many of these lesions may result from mixed infections; for, like broncho-pneumonia, pertussis is "notorious for the bad company it keeps."

Symptoms.—A precise statement of the period of incubation is impossible. It is safe to estimate the latent period as from one to two weeks, but the onset is too gradual and the initial symptoms often too ill-defined to admit of greater accuracy. It is probable that here, as in many other infectious diseases, the incubation period is variable, depending upon personal systemic conditions (resistance) and susceptibilities and perhaps upon atmospheric and telluric conditions as well. Usually several more days elapse before the peculiar characteristic whoop is heard. The infective period also varies, from the very beginning of the catarrhal stage to the end of the spasmodic stage or cough. Association with well children should be prohibited for fully three months.

It is important to distinguish between at least two stages of whooping-cough, the catarrhal and the spasmodic. Sometimes a third more arbitrary stage is described, that of decline. The first—premonitory, catarrhal, or feverish—stage lasts a week or ten days. The child is "poorly," with slight fever and a dry, ringing cough. The cough of this stage is not materially different from that due to simple catarrh, but occurs more often at night, often keeping the patient awake and struggling to repress the disagreeable tickling sensation in the throat. Ordinary cough remedies have little effect in repressing this. In the daytime the child may be fairly well, perhaps with diminished appetite and not quite up to normal health. Auscultation of the chest may reveal a slight evidence of bronchitis, or the physical finds may be singularly few. Gradually the cough becomes more and more paroxysmal, and the child passes insensibly or gradually into the second or convulsive stage. At the end of the second week, or it may be after only a few days, the characteristic whoop occurs; the cough returns in repeated paroxysms; the onset of the paroxysm is very sudden: a series of rapid expiratory coughs occur; these are at once followed by a short and distinct "whoop,"

ong, noisy inspiration; then succeeds another series of expiratory ghs, similar to the first, followed by a louder "whoop," and so on three or four attacks, until the child is quite worn out. The attack quently ends by severe vomiting. It may readily be seen how ty or fifty such paroxysms during the course of twenty-four hours, ny or most followed by regurgitation of food, will greatly exhaust e child, and as the disease continues for a long period, pertussis is ghtly to be dreaded. As has been before stated, the termination of a roxysm is denoted by eructation and vomiting of bits of food, stringy ucus, and sometimes small quantities of blood. During the coughing- t the face becomes dusky and cyanosed—indeed, all through this tage, owing to the frequent and severe coughing, the face presents a eculiar livid appearance and the eyes are swollen and watery. lany children become angered by the paroxysms. The duski- ess of the skin is due to capillary congestion, and often there are ex- ravasations of blood into the conjunctivæ, the whole conjunctival urface sometimes becoming blood-red. A sharp bleeding from the ose often accompanies or follows the paroxysm. Sneezing is a com- non phenomenon, sometimes replacing the cough for longer or shorter eriods. After this stage of four or five, sometimes seven or eight, eeks, the paroxysms grow less in number and severity, the "whoop" lisappears, the lungs clear up, and convalescence is established. A light ulceration of the frenum of the tongue is often noted.

The blood in pertussis exhibits rather characteristic finds from a ery early period in the disease. There is a moderate leucocytosis ith a pronounced preponderance of lymphocytes (lymphocytosis). hese finds are of vast value in making early determinations in suspi- ious cases, and possess incalculable worth in institutional cases, for rompt isolation may follow (Barach, Kolmer and others).

Complications and Sequelæ.—The most common and dangerous mplications of pertussis are bronchitis and bronchopneumonia. hese occur oftener in the winter months. Atelectasis of a portion the whole lung may prove a fatal complication in very young chil- en, especially those of strumous or rachitic type. Occasionally euritis with effusion or croupous pneumonia arises in the latter ages, and empyema has been observed. Emphysema is not a very re complication where the amount of coughing is great, but this ually passes away entirely. A much rarer complication, and one ught with sudden and great danger, is edema of the glottis. A small yish or yellowish-gray ulcer is frequently found upon the frenum of tongue, due to impaction against the lower incisor teeth. While

vomiting is a symptom commonly present and usually ends a pronounced paroxysm of coughing, it may become of such frequency and severity as to endanger life by producing starvation. Chronic diarrhea, also, may be a late and stubborn sequel. A certain amount of hemorrhage from the lungs not infrequently accompanies the paroxysm in severe cases, but more often there is bleeding from the mouth and nose. Cases of true gastric hemorrhage, while very rare, have been reported. An effusion of blood may also take place into the meninges. Hemorrhage into the subconjunctival tissues is not at all unusual. Epistaxis, frequently repeated, tends seriously to deplete the sufferer. The heart muscle may be affected by toxins and the strain on the right heart may be great enough to produce fainting or even sudden death. The nervous sequelæ of pertussis are sometimes severe; convulsions, especially in young children, may cause death. Spasm of the glottis, aphasia, hemiplegia, and loss of vision of a more or less transient sort, occur quite often. During the attack of coughing involuntary passage of urine and feces may take place. Nephritis may occur as a complication as a sequel to this disease. (See Nephritis). Cases have also been reported in which diabetes mellitus has followed the attack of whooping-cough. Glandular enlargements, particularly those of the bronchial glands, are not uncommon. Relapses or recrudescences of whooping-cough have been observed, but these are to be carefully distinguished from mere instances of return of the paroxysmal cough. Many children who have had whooping-cough will have recurrences of spasmodic coughing (with an actual whoop), whenever they contract any inflammation of the throat, larynx, trachea, or bronchi. I have seen such recurrences over a period of three years. If it have been positively determined that the child once had pertussis, such recurrences may be viewed as non-contagious. The children who have but they have not whooping-cough.

Diagnosis.—In the beginning it is practically impossible to differentiate whooping-cough from ordinary catarrhal states unless the whoop appears. When once this is established, there should be little difficulty. In the absence of whoop, a prolonged severe cough and catarrhal state, with freedom from fever, the increments appearing at night and being of a spasmodic character, emphasize suspicion. Children may have whooping-cough yet never exhibit the characteristic whoop. In all suspected cases, blood examination should be made.

Prognosis.—This depends upon a number of conditions, chief

which are the age of the child, the state of previous health, the hygienic conditions surrounding the patient, and the occurrence of complications. Infants under six months of age are in grave danger when attacked by this disease. We have seen death on the twelfth day of life, the patient having developed a hemiplegia in the first convulsion. Throughout the whole period of infancy the disease is fraught with menace to life. The tuberculous and the rachitic are likewise menaced by whooping-cough, latent tuberculous lesions tending to flare into activity, and the rachitic tending to develop convulsions and respiratory complications. In institutions, pertussis is dangerous, because of the subjects that it attacks and because they are exposed to more varied infectious elements. Middle-ear disease, pneumonia, exhausting diarrheas and convulsions are dangerous complications.

Treatment.—The indications to be met in the rational treatment of whooping-cough are very clear. They are: 1. To stop the disease or limit its length and severity when possible; 2. to lessen the number of exhausting, and it may be dangerous, paroxysms; 3. to maintain nutrition during a lengthy and exhausting siege. The treatment that we here outline has proved satisfactory and life saving in our hands:

1. *The Specific Treatment.*—It has been remarked that quinin sometimes seems to exert a specific influence. This we have had an opportunity to observe in several cases. It has shortened unquestioned attacks to a remarkable degree—in one case to ten days after the initiation of the treatment. We always give quinin in rather full doses. Three grains per diem is the average dosage for a baby of one year, and six grains in the day for a child five years old.

The specific bacterin (Bordet and Gengou) has yielded good results in the hands of several clinicians. We have had a limited experience in its use, and have been favorably impressed with its value. In one case we employed it prophylactically and it failed. In the case of the same child, however, it subsequently served to mitigate the severity of the disease. In five other children, a small number it is true, the number of paroxysms was lessened, their severity was decreased, and the course of the disease was shortened. In one home there were four children, and two of them had broncho-pneumonia complicating their pertussis. We used the bacterin in the two younger children, both of whom were just beginning to cough. Negative evidence is of little value; but neither of the injected children contracted pneumonia and both ran milder courses than their older sisters.

The patient should receive at least 40,000,000 bacteria at one injection, and the injections should be made every third or fourth day.

2. *The Reduction in the Number and Force of the Paroxysms.* Though many drugs have been vaunted for this purpose, there are t three that have really stood the test of time—antipyrin, the bromi and belladonna. They are mentioned in the order of their usefulne We always employ antipyrin, seldom in doses of less than one gr every three hours, and rarely more than two grains at three-h intervals. It is our usual experience to have the number of paroxys materially lessened in a very few days. Thus, one child who was hav about forty a day when the treatment was initiated, was having four and five a day in the course of the succeeding week. When paroxysms are very numerous at night, we employ bromides du the afternoon and evening. Belladonna, to be efficient, must be pus to its physiologic limits.

When food seems to excite paroxysms of coughing, we comm the spraying of the nose and throat just before meals. We em the three sprays mentioned in our chapter on acute coryza. (N an anesthetic spray, containing cocaine and antipyrin; No. 2, a s solution or alkaline spray; No. 3, an oily spray.) Troublesome co ing at night may sometimes be relieved by the generation of medic steam in the sleeping apartment.

Kilmer, of New York, has devised a whooping-cough belt th very useful in this same connection. Children, old enough to des their sensations, will ask for these belts if they chance to be left or if they happen to be loose, they will ask to have them tighte Inhalations are ofttimes of value.

3. *The Maintenance of Nutrition.*—We keep the child in the whenever possible. Rain, snow and high winds are our only deterr We give a concentrated, highly nutritious diet, and feed every hours. Highly seasoned foods, solid foods and dry foods are avo These are the foods that incite coughing and reflex vomiting. A thetic sprays (*vide supra*) are used when vomiting occurs despite precautions.

It should be a punishable offense to take a sufferer with pertus a church, Sunday-school or doctor's office. No truly good paren take an affected child in a train or street car. The danger to the w the young and tuberculous of an attack of pertussis is simply appal

EPIDEMIC INFLUENZA

Synonyms.—EPIDEMIC CATARRHAL FEVER; LA GRIPPE

In the last few years epidemic influenza has obtruded itself very important disorder in most civilized countries, and is to be f

intermittently in nearly all parts of the United States. None of the infectious diseases deserves more prompt and intelligent management, both in prophylaxis and in treatment. Complications and sequelæ demand the most careful and protracted attention. The facts that the infection attacks very young children with great readiness, that one attack cannot be said to protect against another, at least for any length of time, and that the prostration is out of all proportion to the obvious organic disturbance, make it a disorder which calls for the utmost medical skill.

Epidemic influenza may be described as an infectious disease caused by the bacillus of Pfeiffer, attended by profound weakness and serious catarrhal disturbance of the respiratory or gastro-intestinal organs, severe pains in various parts of the body, and many distressing and dangerous nervous phenomena. There is no distinct type of infantile influenza. It is remarkable in that it complicates some diseases and appears to be antagonistic to others, notably scarlatina and diphtheria. Scarlatina seems to be subdued by it into a very mild form. With diphtheria it is rarely associated, although influenza is frequently accompanied by a form of sore throat, with yellow, pulpy deposit in large masses, closely resembling diphtheria; but in this is not to be found the Klebs-Loeffler bacillus, and it disappears promptly upon treatment, even by local measures only. In the character of their toxic influence diphtheria and influenza have many points of similarity; the extreme depression, slowness of recovery, and susceptibility of nervous tissue mark them as much alike; so, also, the influence of these poisons upon the heart, with the slow or irregular pulse, long maintained and sometimes never quite restored.

Etiology.—The essential cause of influenza is now admitted to be a bacillus, for whose discovery we are indebted to Pfeiffer, in 1892, and the isolation of which is attended with a good deal of difficulty. It is a small, specific organism, resembling the bacillus of mouse septicemia, but shorter, with rounded ends. The culture ground seems to be mucous membrane of the nose, throat, and bronchi, where it is found in large numbers. The earliest site of infection is usually the throat, though any tissue *minores resistentiæ* in the respiratory tract (nasal spurs, adenoids, hypertrophied tonsils, etc.) may determine the point of invasion. There are certain other contributory causes pointed out, among which meteorologic conditions are mentioned. The spread of the disease is of extreme rapidity and along the lines of travel. It travels moreover at about the same rate that commerce travels as was wonderfully shown in the pandemic of 1889 and 1890 (J. C. Wilson).

The bacillus of Pfeiffer is found only in cases of influenza. It i difficult to obtain a pure culture. The influenza poison belongs t the group of bacterial proteins (Buchner)—*i. e.*, poisons which occu in the bodies of the organisms and are not excreted, or only to a limite extent, into the media in which they grow; in this they resemble th diphtheria and tetanus bacilli. The toxin of influenza acts on the cen tral system most powerfully. Locally the effects are exerted chiefl upon the respiratory tract. It does not penetrate to any great depth and only very rarely enters the blood, as shown by Cantani' experiments.

Mixed Infections.—The bacillus of Pfeiffer is frequently associate with other micro-organisms, such as the pyogenic cocci and the pneumo coccus. The bacillus of influenza has been cultivated in the presenc of other microbes, especially the staphylococci. In cases of otiti media and inflammation of the membranes of the brain the bacillus o influenza has been found correlated with staphylococci, streptococc and pneumococci. In the pneumonia of influenza some cases on show the bacillus of Pfeiffer, others are associated with the bacill lanceolatus; most commonly the bacilli of influenza are found wi streptococci. In some cases there is also associated the tuber bacillus; and sometimes diphtheria bacilli (Wynekoop). Also ca of obscure clinical manifestation show the influenza bacillus associat with scarlet fever, measles, and pneumonia. This will go far to expl variations of symptoms, since the resulting toxins produce var morbid effects (Sansom).

Symptoms.—One of us describes epidemic influenza to his stude as the hysteria of infectious diseases because, like hysteria, it may sim late almost any other of the infections, and as in hysteria, the simulat is never perfect.

The incubation period is probably about two or three days. T usual form of the influenza attack is a severe catarrh of the up respiratory organs, often beginning with sneezing, sometimes as a lar gitis, or as a tonsillitis, and rapidly extending to the bronchi and lun Along with these catarrhal symptoms are usually present pains in head or elsewhere—neuralgias or myalgias, disturbances of the he action, and extremely irregular fever. The next in frequency is ac gastritis or diarrhea, or both, also associated with pains and the ot symptoms mentioned. The third form depends upon involvement of brain or nervous system. It is manifested by irritability and fretfuln (almost pathognomonic), or there may be hebetude, or rather apat from which the child is easily roused, and is then fairly bright, not s

and dull of speech as in typhoid fever. Occasionally convulsions or coma vigil is seen. In other words, cases of epidemic influenza are usually classified as belonging to the respiratory, gastro-intestinal or nervous types. All sorts of combinations are observed, however; thus, a patient with coryza may have most severe nervous symptoms, etc. At first there may be chill and delirium, possibly a convulsion, and usually extremely rapid, more or less irregular, pulse. Indeed, the history of chill is always secured from the patient old enough to observe and describe his sensations. At once the temperature may begin to be high and irregular, but not, as a rule. There may be a persistent temperature of 101° F. (38.3° C.) or thereabouts maintained for a long time despite all efforts to reduce it. This may alternate with or be followed by subnormality. The temperature range is affected by coal tar products as in no other infectious disease. They seem to have an almost specific action, even in small doses. All these three groups of symptoms, or so many of them as are not masked by the others, may occur together or in rapid succession. Headache or other pain is evidenced only by the young child putting his hand to the suffering locality, or there may be only a tenderness on being touched. The conjunctiva is often irritated, and tears are secreted in excess.

The respiratory catarrh is liable to extend alarmingly, involving first one lung, then the other, producing severe bronchitis or bronchopneumonia, which sometimes clears up unexpectedly or swiftly destroys life, largely in proportion to the not to be predicted severity of the toxemia or the resistance and vigor of the child.

When the digestive organs bear the brunt of the attack, exhaustion is from a double cause. Malnutrition is severe, appetite is often lost after the vomiting or diarrhea is controlled, and a wretched picture of collapse and emaciation is presented.

As a rule, the younger the child, the less characteristic are the phenomena. In the very young, gastric symptoms prevail. The spleen is sometimes enlarged; albuminuria occasionally appears. One of us has seen an infant suffering with epidemic influenza at birth, the mother having a premature birth as a result of her own severe attack of grip. (Ballantyne records similar experiences.) In another case a baby who had been exposed to an old lady with severe grip, on the first day of his extra-uterine existence, became very ill on the third day of life. He nearly perished.

Complications and Sequelæ.—Few toxins generated in the human economy are more depressing to great nerve centers than that evolved in grip. The Irishman who defined it as "the ————

disease that left you sick six weeks after you had gotten well" kn whereof he spoke. It is also a disease that seems to pick out w spots and to cause latent diseases or tendencies to spring into pat logic activity.

The middle ear suffers very often, pneumococci, streptococci staphylococci playing etiologic rôles. Cervical adenopathies are c mon, sometimes acting much like Pfeiffer's "glandular fever," other times undergoing suppuration, or persisting to eventually cas Curious pneumonias are common, sometimes presenting the phy signs of croupous pneumonia, except that they do not involve the w of the affected lobe. Broncho-pneumonias also occur. Empye are common sequels of such pneumonias. In the upper respir tract, sinus congestion occurs in older children as it does in ac (See "Headache.")

Some authorities contend that epidemic influenza does not a the heart or pericardium, unless complicated by rheumatism. Fi years ago, however, we saw together a youth, who developed in sequence endocarditis, pericarditis and peritonitis. The same v Drs. Musser and Swan had a similar case, and still another in th ceeding year. Far more common, however, are influences upo rate and rhythm of the heart. Tachycardia, bradycardia and irre heart beat are common sequelæ of influenza in childhood.

Severe vomiting and diarrhea have been mentioned; but it is n sary to speak of appendicitis. Philip Marvel, of Atlantic City clearly shown that appendicitis became more common after ou great epidemic of influenza (1890). We have both seen the assoc of the two affections in the same patient a number of times.

Nephritis may accompany or follow grip, and it is usually h rhagic in type (Miller). Cystitis is another fairly common complic particularly in baby girls.

Various forms of exanthems may accompany grip, and they give us much trouble in excluding the possible presence of me rubella, scarlet fever, etc.

Rheumatism may originate in an attack of influenza, or the matic subject may suffer a violent exacerbation. To the tuberc the disease represents a serious one indeed. One of the chief v of out-of-door life for these patients is that they so escape infe of this character. Diabetes mellitus is made much worse if the su of it gets grip. Even a quiescent tooth may give serious troul soon as its possessor succumbs to this disease.

Influenzal meningitis is rapidly fatal. Many organic and functional nervous states may arise during or after epidemic influenza.

Diagnosis.—If the disease is not known to be prevalent, the earlier cases are liable to be overlooked, unless of great severity. Ordinary acute catarrhs, however, are rarely so severe or accompanied by such pain and prostration, nor does the process extend to contiguous organs. When influenza is epidemic, there is less difficulty in recognizing an attack, which is marked by rapid onset, sudden and high rise of temperature, and usually evidence of pain in the head or generally about the body or in some limited locality. Cases of sudden irritability of the stomach and intestines, accompanied by head pains and severe fever, may be assumed to be influenza during such epidemics. From pneumonia it may be differentiated by the absence of physical signs in the presence of the general symptoms of chill, cough, etc.; but very soon we may find actual pneumonia as a complication, either when it is thus suspected or following mild attacks of catarrhal fever, when not anticipated; and yet characteristic physical signs will be demonstrated upon search. As related, such pneumonias are peculiar in type.

Influenza resembles measles in its onset, both in catarrhal symptoms and sometimes in the rash. At other times scarlatina is simulated by the throat symptoms, along with a scarlatinal rash, both usually of short duration. When the lung symptoms or the febrile movements are protracted and severe, miliary tuberculosis may be feared. Typhoid fever may closely resemble catarrhal fever, even in the matter of eruption; but the rose-colored spots in catarrhal fever are more numerous, extend over larger areas, persist longer, and remain as slightly brown discolorations for some time after fading. The fever, moreover, is more irregular than in typhoid, nor do we see the apathetic face so constantly, the countenance being pale in influenza and flushed in typhoid. The mind, moreover, is clear; the temper is often irritable. The temperature in influenza occasionally (typus invertens) shows an evening fall and a morning rise (the reverse of typhoid progression), and often there are a marked rise and fall at periods of a week. The longer duration of typhoid fever and the final finding of the positive reaction to the Widal test in the latter disease will serve to settle the diagnosis. Oftentimes meningitis and influenza are scarcely to be differentiated, though in true meningitis the muscles of the neck and back exhibit a characteristic and intense rigidity, of a persistence not seen in catarrhal fever, unless the Pfeiffer bacillus actually attacks the meninges. The diagnosis may be delayed during

the progress of ill-defined and mild symptoms, but is made known by the feebleness of the child during convalescence, especially by a weak, irritable heart and disabilities of various sorts, especially for sustained exertion.

The arthritis which in some cases accompanies and in others follows upon influenza is sometimes a simulated, not a real, rheumatism, while at other times the rheumatic subject suffers a relapse in grip, or a true attack of acute articular rheumatism is observed as a sequel of grip. Again, we would emphasize the fact that influenza simulates many diseases; but never perfectly. There are always missing and peculiar links in the chain of evidence.

Prognosis.—Influenza may be a very fatal disease, partly from the virulence of the toxin generated in the blood, which may kill outright, and partly from the devitalizing effects wrought upon the great organs, and also from its serious sequelæ and complications. In early infancy the disease is very fatal, as it is at the other end of life. In children these resulting effects are milder and more limited than in adults. Neuritis is rare. Persistent nervous cough is perhaps the most frequent. Gastric influenza with profuse nervous vomiting occurs in very young children; there is also an influenzal dysentery, most persistent and depleting. The mortality varies in different epidemics, and in some of them children are more affected, in others adults. Death results in most cases from paralysis of the diaphragm (Allyn). All kinds of children are apparently attacked indiscriminately. So sudden is the fatality that sunstroke and malignant malaria or scarlatina may be suspected. The digestive and respiratory organs may escape, the poison overwhelming the nervous system. Weaker children naturally succumb more readily. Robust children, however, are frequently changed into frail, feeble beings for years or for life.

Treatment.—Prompt and efficient isolation with full means for disinfection is demanded from the start. It is our custom to warn parents that people suffering with affections of the air passages must not be allowed to caress the baby or indeed to come in contact with children. During epidemics of influenza such advice is accentuated. All that has been said of prophylaxis in the common cold, we advise here.

To this there should be no demur nor temporizing, though neither the public nor the health authorities fully realize this yet. The treatment of the patient must be symptomatic, and among the first comes relief of pain. During the stage of high fever repeated hot foot-baths are most grateful; and aconite tincture, 1/12 to 1/8 minim, carefully

atched, may be given every ten or fifteen minutes, soon to be followed y the coal-tar antipyretics (for only temporary use), and next full timulation by champagne or spirits in water, hot or cold, at short ntervals. Small doses of coal-tar products, usually acetphenetidin (gr. i–gr. ii) or aspirin (gr. ii–gr. iv), are more useful in epidemic influenza than in any other disease that we know. They are given as analgesics, however, and never with the object of reducing temperature. They almost seem to exert a specific influence at times. Secondary in importance to the coal-tar products are the salicylates (usually strontium salicylate) and the benzoates (sodium benzoate). It may be necessary to cut off food, in the presence of vomiting, and a light, concentrated and easily digestible diet should be given when the fever is high; but a full nutritious diet must be given as soon as it can be borne. The feeding must be forced despite the common anorexia. When the stomach is very irritable it is well to depend upon hypodermic medication as much as possible.

For the respiratory catarrh a combination of atropin, morphin acetate, heroin, or codein, in small repeated doses, gives great comfort. This had best be accompanied by strychnin or digitalin to sustain the heart. Quinin is also indicated. For vomiting, bismuth subcarbonate may be given in chloroform or peppermint water or cinnamon water. For very severe gastritis cocain will often relieve, 1/30 or 1/20 of a grain being given every half-hour. (See Gastritis.) A prompt action from calomel, 1/10 of a grain every half-hour, is certainly useful here. The hot foot-bath helps this, too, as does mustard to the epigastrium or neck.

Rest in bed must always be enjoined during the febrile period and as long as the most severe catarrhal symptoms persist. For intense muscle pains the hot-pack or steam-bath, general or local, is comforting; for painful limbs external applications of methyl salicylate, followed by the flannel bandage.

In several cases, mixed influenzal bacterins (Mulford) have yielded us striking results.

Convalescents demand the most watchful, persistent care. Here he great stand-by is strychnin in increasing doses (up to the verge of oxic endurance when great depression persists), and long-continued onics and nutrients, persistent overfeeding, predigestion, measured mounts of easily digested foods, tonics of various sorts—hypophosphites, the organic phosphorus products, cod-liver oil, and, above ll, change of air, which is always demanded in tardy or incomplete onvalescence.

MUMPS

Synonym.—Specific Parotitis

Mumps is an acute specific infectious inflammation, characterized by pain and swelling of the parotid and other salivary glands, with occasional (rare) metastasis to the mammæ, ovaries, or testicles. It runs a definite course, and one attack usually confers immunity, particularly when it is bilateral.

Etiology.—The cause is evidently a specific poison, which has probably been detected by Laveran and Catrin, Herb and others. The organism is a diplococcus, which, injected into Stenson's duct of monkeys and dogs produced parotitis. The germ enters probably by the mouth, reaching the parotid gland by Steno's duct in the human being. This disease is observed in all lands, at any time of the year, but is most common in these latitudes during the fall and winter. Males are more liable than females, and the most susceptible age is between the third and fifth years. The period of incubation is generally two weeks or more.

Fig. 110.—A Typical Case of Parotid and Submaxillary Mumps.—(*Courtesy of J. F. Schamberg.*)

Symptoms.—These vary, depending on the nature of the epidemic and of the individual attacked. The stage of invasion lasts from twenty-four to seventy-two hours. The local symptoms usually have a duration of from eight to thirteen days, during which time complications may set in. The stage of invasion is accompanied by a rise of temperature, malaise, some loss of appetite, and occasionally vomiting. The first local symptom is a pain in the space between the mastoid process and the lobe of the ear. Very soon this painful spot increases in size, until the whole region around the ear becomes affected. As a rule, the swelling begins in the same place in which the pain is first noticed, and the enlargement becomes general, usually in from three to six hours after its first appearance. Both glands are not attacked simultaneously; it begins in one and has time usually to run its course of inflammation, to be followed in a few days by the enlargement of the second gland. Subsequently, or possibly antecedent, to the parotid

involvement the submaxillary and sublingual glands may be affected. When there is much tumefaction of the submaxillary glands the patient presents a most grotesque (full-moon) appearance. (See Fig. 110.) Upon the characteristic swelling and its accurate observation depends the correctness of the diagnosis. Much consolation may be derived from the reflection that the acme of the process is attained very quickly and is short lived. The principal complication of this disease is an inflammatory enlargement of the testicles (orchitis), spermatic cord, and inguinal glands in males, especially liable to occur about the age of puberty, and in females an involvement of the ovaries, labia majora, and mammary and inguinal glands. In several epidemics among the students at the University of Pennsylvania dormitories, a great many cases of orchitis occurred. These are, in our experience, rare. Complications do not, as a rule, appear until the inflammation of the parotid gland has subsided.

Diagnosis.—There is but one gland that lies around the ear —*i.e.*, in front of the ear and following its outline, not only anteriorly, but below and behind—and when this swelling is localized as to this general outline, we are dealing with only one disease—parotitis. Holt has well described the lobe of the ear as occupying the center of the swelling. If one stops to consider the boundaries of the parotid gland, he will readily see why this should be so. Parotitis does not always mean mumps, however, as it may occur in typhoid fever and in septic conditions (suppurative parotitis). It is common to learn of other cases in the vicinity, and this helps the decision.

Prognosis.—When the inflammation is uncomplicated, the prognosis is favorable, one of the chief dangers being edema of the glottis, or, as occasionally happens, the parotid gland may break down, forming an abscess. When metastases arise, as to the mammæ, ovaries, or testes, the prognosis is not so favorable. Although rare in our experience, such conditions are painful, and while considerably lengthening the duration of the disease, they do not, as a rule, cause serious danger to the individual. Still, the possible complication of mumps warrants great care during an attack to guard against chill, fatigue, or digestive disturbances. The complicating orchitis may result in sterility. Meningitis is a rare complication. We have also seen a case of polyarthitis as a complication of mumps.

Treatment.—This is palliative and expectant. The diet should be liquid for a week. Warm or hot applications to the swollen glands, as hot olive oil applied on cotton, will almost always prove acceptable to the patient. When the pain is considerable, small doses of an opiate,

as Dover's powder, may be given, combined with phenacetin or salol. The bowels should be kept open, and when the fever is high, it may be reduced by sponging the body with cool water—70° or 80° F.—or by suitable doses of aconite or other febrifuge remedies. Hesamethylenamin has been used by us, we believe with good results. As a general rule, it is well to keep the child quarantined while the disease is in progress, as its infectiousness cannot be questioned; neither should parotitis always be treated carelessly as an insignificant disease, as occasionally cases of fatal gangrene of the parotid and cervical glands have been reported, and Joffroy has mentioned a case in which peripheral neuritis followed, with paralysis of the extremities lasting four months.

For glandular involvement the inflammation is relieved by various local remedies, as lead-water, laudanum, menthol, or witch-hazel, and the like. Ichthyol, 25 per cent. in lanolin, is soothing and detergent. Painting with menthol is recommended. All measures should be supplemented by support and rest. Packing in dry cotton-wool answers very well.

To an inflamed testicle, the application of adhesive strips will yield prompt relief.

TYPHOID FEVER

Synonym.—ENTERIC FEVER

Typhoid or enteric fever is an acute infectious disease due to a specific bacillus (Eberth). In children it is in most essential respects similar to the same disease in adults, although in some clinical features there are differences which must be considered. Moreover, typhoid fever in recent years differs in many particulars from those forms observed and described in the past. For a long time it was thought that infants and young children were immune to this disease; but although rarely, yet we do find it occurring in children only a few months old, but in these instances it is almost inevitably acquired from a nursing mother who is herself infected. We have, ourselves, recorded cases of this disease in babies of five and eight months of age.

Typhoid fever may be described as an infectious disease, due to the bacillus of Eberth, and is characterized by a continued fever lasting usually from one to three weeks, and a peculiar eruption of small rose-colored spots which disappear on pressure and appear in successive crops. Along with these are certain characteristic lesions in the ileum, accompanied by gastro-intestinal catarrh. The prevalence

f this disease among children is presumably much more extensive han we can ascertain, as many cases of mild and ill-defined character robably are never recognized as such. Especially is this true among he poor. A group of other affections, closely simulating typhoid fever linically may be due to the various para-typhoid group of organisms.

Etiology.—The causes of typhoid fever may be said to be predisposing, specific, and contributory. Undoubtedly there are certain individuals who are more liable to this disorder than others, and these vary in their susceptibility. Many collateral causes influence susceptibility, of which the season of the year is one of the most pronounced; so much so that it has received the name of "autumnal fever." Age also is an important factor, by far the largest number of cases occurring in later childhood and early adult life, and less both above and below the ages of fourteen and twenty-five. There is little influence exerted by sex, climate, or mode of life. Atmospheric conditions affect the prevalence of the disease, dry heat seeming to favor, and cold and damp rather to check, its prevalence. The invasion is usually by the mouth and stomach. A degree of immunity seems to be acquired by repeated exposures to infection.

The bacillus of Eberth is constantly found in those dying of typhoid fever. The relationship of typhoid fever to defective plumbing and drainage is not clear; but it is certainly more prevalent when such conditions are existent. It may be that either flies or existing winds carry the dried contagium under these conditions. (See the studies of Victor Vaughan at Camp Alger.) Strictly speaking, enteric fever is contagious, but it is very rare to learn of instances of direct contagion. Undoubtedly, in the homes of the poor, where one member of the family is infected others acquire the disease. Here two causes are at work: similarity of infective source and direct or immediate contagion. Nurses in hospitals have acquired the disease, presumably from handing the dejecta—the feces and urine—or by food thus contaminated, and the soiled clothing. Thus bacilli may be passed by accident into the mouth, and thence proceed to work their mischief in the ordinary way. Flies or other insects may be the obscure source of conveyance.

Intermediate contagion is by far the most common. In most instances the poison is conveyed by drinking-water. Various articles of food, particularly infected milk, are equally responsible, but this again may be directly or indirectly through water conveyance. The bacilli retain their vitality for weeks in water, but probably do not increase therein to any extent. They retain their virility for a month or more, even when dried. They may live in ice for months. In the soil

they remain vigorous, and also increase, and so in milk; they are readily cultivated without changing their appearance. "Once in the intestinal canal, the typhoid germs probably do not, like the cholera bacilli, increase in the secretions, but perforate the epithelial lining and reach the lymphoid tissue, upon which they exert their specific action, causing a cell proliferation greatly in excess of the physiologic process" (Osler). When introduced into the human body, the bacillus is capable, under favorable circumstances, of indefinitely reproducing itself and retaining its activity. It tends to collect in certain organs, especially in the liver and spleen. "The bacilli penetrate into the solitary follicles and Peyer's patches, and there multiply and form colonies. From these colonies they migrate by way of the lymphatic vessels to the mesenteric ganglia, and by way of the radicles of the superior mesenteric veins to the liver, to be finally distributed by the blood current to the spleen and other organs" (Wilson). They are excreted by the kidneys, as well as by the bowels. Incubation varies enormously and is variously stated to be from two days to three weeks. Immunes may carry in their organisms and may continue to excrete typhoid bacilli for considerable periods of time. Convalescents from the disease, and those thought to be fully recovered, may also continue to excrete living typhoid germs for many months or even years. Such individuals represent ever present dangers of contagion to communities.

Morbid Anatomy and Pathology.—The postmortem findings in typhoid fever are thoroughly characteristic and quite independent of symptoms. The febrile movement and various items making up the clinical picture of enteric fever are quite independent of these lesions, and are due to the action of specific poisons or toxins. The anatomic lesions, as pointed out by Wilson, fall naturally into two groups, the first including those which arise from the local action of the bacilli and their concentrated toxins, and affect changes chiefly in the lymphatic system and the intestinal canal. The second group includes lesions due to long-continued constitutional infection, consisting of degenerative changes in various tissues and organs, particularly the liver, kidneys, voluntary muscles, heart, salivary glands, and pancreas; less conspicuously in the nervous system. These last are least extensive and conspicuous in children, nor have they been so carefully studied. The most conspicuous lesions are seen in the digestive tract, though here the destructive changes are far less than in adults. Ulceration, while not infrequent, is much rarer than in adults; the process is more of a hyperplastic change. Oftentimes

: is only moderate redness and swelling of Peyer's patches, solitary
:les, and mesenteric lymph-nodes, lesions frequent in cases of
ıle diarrhea. We now know that typhoid fever may exist without
intestinal lesions whatever. Sometimes the disease occurs in the
ire of a septicemia, or the process may be localized in the pelvis
kidney, in the gall-bladder, in the periosteum of some bone, or in
r tissues. Park speaks of the great importance of recognizing
nature of the disease in these irregular instances. Sometimes
pharynx exhibits diphtheric exudation; the esophagus is at times
rated, and the mucous membrane of the stomach inflamed. The
ıtant and characteristic lesion is of the solitary and agminated
ıds in the lower part of the ileum, evidenced at first by swelling
hyperemia, attaining their maximum about the end of the first
k, and then undergoing resolution without ulceration. If the
phatic infiltration continues, in another week necrosis results and
ulcer is formed, which in children has a tendency to heal. If the
:ration becomes deeper, it may involve the whole of a Peyer's patch,
, attacking the walls of an artery, produce hemorrhage, or the wall
he intestine may be perforated unless protected by a plastic lymph.
ɔerplasia of the lymph-follicles, in children especially, occurs in
er diseases involving the intestines, as in measles, diphtheria, and
:let fever. In children the swelling of Peyer's patches is seen
ier than in adults, and most often near the ileocecal valve, but is
found higher up in the small intestines. When typhoid fever is
uired in infancy, it is liable to be very severe; but the lesions need
be marked in the intestinal tract. It is the intense bactericemia
kills. From then on to six or seven years of age, the disease is
ı less severe, and the lesions described as peculiar to childhood
:ound. Hemorrhage is also comparatively rare, and seldom occurs
er than the third week. The spleen is usually found swollen and
ll cases more or less involved, but distinctly less so than in adults.
ous other changes incident upon intense toxic infection and
racted fever are seen in other organs, such as a hyperemic state
ıe liver, diminished amount of bile, degenerative changes in the
eys, with or without albuminuria. The heart is liable to involve-
t, and while endocarditis and pericarditis are rare, the myocardium
ble to become relaxed and flabby or may undergo fatty degenera-

The voluntary muscles suffer sometimes profoundly. The
s exhibit characteristic changes resulting from enfeebled circulation
obtunded nerves. Hypostasis is common, also pulmonary edema.

Lobar pneumonia not only occurs, but sometimes appears at the beginning.

Symptoms.—The course of typhoid fever in children, while less severe (except in infants), is very similar in its more conspicuous features to that of adults. It is of shorter duration, with the nervous phenomena at times overshadowing those of the intestines. This is true of by far the larger number of cases as seen by the average observer. We are more liable to meet with and recognize instances of the disease which pursues the ordinary course, as seen in older folk. There are those who do not agree with this view, but regard the disease as manifesting itself differently in children. The successive periods of development are not so clearly defined. Very many less well-marked cases escape attention, unless it be very sharply aroused, and this frequently happens, the cases presenting themselves only during a relapse or in the stage of subsidence. In young children the disease is more apt to begin with a sudden onset, with many of the symptoms fully developed. The febrile process is generally less severe, although the temperature-range may be equally high. The symptoms rarely reach the same severity as among adults; the complications are fewer, and the sequelæ less marked. Prodromes, except in severe instances, are usually of the vaguest, and these are generally connected with the digestive tract. Nosebleed is rare in children, and so is diarrhea, and headache is seldom complained of. The temperature, when typical, rises slowly for from two to seven days, remitting a degree or two, or even three, in the second week, declining steadily in the third week, at the end of which the normal is reached; it may even appear to fall by crisis in some cases. It may shoot up abruptly to 102° or 105° F. (38.8° to 40.5° C.) at once, but later run the regular course of gradual rise and fall, morning remissions with evening exacerbations, oftentimes by no means so marked as with adults, and may even be absent. The pulse is frequently found to be slower than should be expected from the degree of temperature, as in older folk.

In young children the febrile progress is often only from eight to fourteen (8 to 14) days (Morse), the average course under ten years is 19.3 days; ten to fifteen years, 22.6 days; after the age of ten this course is much like that of adults. The maximum fever in mild cases is 103° to 104° F. (39.4° to 40° C.); in severe cases it may reach 105° to 106° F. (40.5° to 41.1° C.)—higher than in adult cases of similar severity.

Typhoid fever is perhaps the only disease in which the temperature runs higher in older than in younger children (Holt). Subnormality

btains at the end of the course, and rises are due to intestinal or other isturbances. The tongue is not so characteristic as in adults, and may e quite clean. There is a peculiar thick, heavy coating, with the tip nd margins free, with sometimes a V-shaped oval red place in the enter, which is claimed to be pathognomonic; but the absence of striking lingual features is in no way reassuring. There is usually loss of appetite from the beginning, but food will be accepted, nausea being rare and vomiting more so. The mouth, tonsils, and nasopharynx usually appear inflamed, and may exhibit a fairly severe catarrh, especially in those of impaired nutrition. The bowels are rarely loose, at least it seems so nowadays, constipation being much more frequent than was formerly taught. It is present in about half the cases (Holt). Morse says one-third. Constipation at the beginning may be succeeded by diarrhea later in the attack. The gurgling and pain in the right iliac region mean comparatively little in children, because they can be so constantly elicited even in the well. The spleen is always enlarged and nearly always palpable, provided that one has become accustomed to the Edebohl's method of palpation. This demonstrable enlargement by palpation and light percussion is quite a characteristic and early sign of typhoid fever in children. It is also often tender. The size is an index of prognosis as well as of diagnosis; while it persists, the disease is not ended. The eruption, which is a very common symptom—70 per cent. of cases—is noticed early in the course of the disease, and consists of pale-red, "rose-colored," flat, slightly elevated spots which, on being pressed with the finger, disappear for a moment and reappear somewhat slowly. They are usually few and scattered, but occasionally very abundant; generally seen on the abdomen, but if in large numbers, they may also be found on other parts of the body. They are found on the back, in the region of the shoulders, at times, when absent elsewhere. The abdomen is usually more or less distended, and increasingly toward the middle or latter end of the course. There is almost always very early slight sensitiveness on pressure, but tenderness in children is seldom extreme, and more apt to be present along with constipation. Marked tympany is rare. Abdominal pain is absent. Colic may accompany or precede an action of the bowels. The kidneys are seldom disturbed seriously, though the characteristics of febrile urine are usually present and the Ehrlich test (diazo-reaction) is early positive. There is no constant relation between the condition of the bowels and the intestinal lesions.

The heart, while enduring more readily the depressing effects of the fever in children than in adults, nevertheless requires very careful

watching, as asthenia is by no means rare, and collapse has been known to come without warning. Savestre asserts that syncope and death may occur with the utmost suddenness, and that it is more important to watch the pulse than the temperature-range. The disappearance of the first sound of the heart, while not a grave symptom, is an indication for increased caution and stimulation.

Relapses, which are as common in children as in adults, are practically reinfections, and are more liable to occur after a mild than graver attacks. The persistence of or reoccurrence of an enlarged spleen should always place one upon guard against this possibility. One attack induces a fair, although by no means certain, immunity to subsequent infection. Disturbance of the respiratory system, especially at the beginning, is so common that it may be regarded as a phenomenon of the disease. Cough is common, without corresponding physical signs. Bronchitis, when present, is usually of moderate intensity and hypostatic congestion is less common than in adults. If bronchopneumonia occurs, the respiratory murmur becomes much weakened, and percussion resonance is impaired on the surface of both lungs. Unless complications of an inflammatory nature are present, the leukocytes are usually diminished in number. The Widal reaction is present in about 95 per cent. of all cases.

Complications and Sequelæ.—In children these are mild and not frequent. Bronchitis is a usual accompaniment. Intestinal hemorrhage, perforation, and peritonitis are the commonest and most serious complications, though none is so common as in adult life. Nervous symptoms are often present, but rarely severe. Chorea is not uncommon, and aphasia will be found oftener than in older patients, while post-typhoid insanity is rare. Thrice one of us has seen hemiplegia appear and later clear up completely (probably embolism). Certain of the tissues are liable to suffer apparent parenchymatous inflammation, as the kidney, parotid gland, and muscles. Otitis and parotitis are commoner than in adults. Certain complicating conditions involve the lungs, as thrombosis, embolism, hypostasis, edema, and pneumonia occasionally. The exanthemata may precede, coexist with, or follow typhoid fever. So also of diphtheria and whooping-cough. A dangerous, though fortunately a rare complication, is a destructive (necrotic) inflammation of the larynx. Tuberculosis does occasionally follow. Surgical sequelæ, typhoid rib, tibial periostitis, cholocystitis, etc., are less common than in adults. Tuberculosis is not uncommon, however, and we have seen it cost life.

Diagnosis.—In children, as has been said, the progress of typhoid

ver is attended with so much irregularity that the diagnosis is oftenmes exceedingly difficult, and frequently it is not recognized at all. pistaxis is rare, catarrh of the respiratory tract is common, and the mperature-range is more irregular than in adults. Vomiting is oftenimes the first symptom. Neuroses are frequently prominent, but ignify little; there are often restlessness and delirium, and many times eadache, but seldom convulsions. Constipation rather than diarrhea revails. The rash, the severity of which bears no relation to the severty of the disease, is usually slight. Fatal hemorrhage and perforation re seldom seen. The characteristic phenomena are the enlargement of he spleen, eruption, peculiar temperature-range, and abdominal disention. The method of testing the blood after the manner of Widal ill make the diagnosis much more exact.[1]

[1] *The Serum Test for Typhoid Infection.*—In March, 1896, Pfeiffer and Kolle published n article in which they claimed that the serum of convalescents from typhoid, when mixed ith cultures of the typhoid bacillus and injected into the peritoneal cavity of a guineaig, produced a specific reaction. The bacilli become agglutinated and finally deformed nd dissolved, and this change takes place only with typhoid bacilli when typhoid serum s used, and is due to the bactericidal action of the typhoid serum. This reaction was also lemonstrated in a test-tube, the bacilli falling in fine, whitish flakes and settling at the ottom after a bouillon culture was mixed with the serum from an immunized goat and laced in the incubator for an hour. The first practical application of this method of iagnosis on a large scale was made by Widal, and reported June, 1896, in "La Semaine Médical." He found finally that by drawing blood from the finger of a typhoid-fever atient and allowing it to clot so that the serum separated, and if such serum were then dded drop by drop to the broth culture in proportion of one to ten, at the end of twentyour hours the bacilli were agglutinated and immobilized. Later he noted that the dried erum and the dried blood showed this specific action, occurring as early as the seventh lay of the fever, and remaining for a considerable period after recovery. Widal and Achard ade further tests to ascertain the properties of the agglutination substance. It was ound in the serous fluid of blisters, serum from pus, tears, urine, and milk of persons ck with typhoid fever. This property resides in the globulin and fibrin, but not in the lasma of the blood. The reaction is most pronounced at the height of the infection. has disappeared one day and reappeared the next, but, as a rule, diminishes in intensity on or late after convalescence—months or years. In some cases it does not appear fore the third week, and rarely not at all. Wyatt Johnston, of Canada, introduced e method into municipal laboratories, and suggested that the blood be dried on a glass ide and sent by the physician to the laboratory. The technic at present employed is to tain a few drops of blood from the cleansed finger or ear-lobe of the patient, and allow to dry on a piece of clean paper or a glass slide. This specimen is then sent to the oratory, where the dried blood is mixed with five times the quantity of water. A op of this mixture is placed on a cover-glass, and to it is added a drop of a fifteen- to enty-hour bouillon culture of the typhoid bacillus. It is then examined under the roscope in a hanging drop. In a few minutes (five to ten) the reaction occurs, a few illi moving slowly, while the mass of the bacilli is nearly motionless and clumped ether, or all the bacilli may have ceased moving and be collected into clumps. The is quantitative, not qualitative; agglutinating substances are present in normal blood, in far less quantity. In the blood of a sufferer from typhoid fever the reaction takes e much more quickly and effectively and in greater dilution; the test, to be proper, st occur in a 1 : 10 dilution of dried blood, and within ten minutes. In two-thirds of cases of typhoid fever it is possible to make a positive diagnosis by this means. The ence of the reaction in any single examination does not exclude the diagnosis of typhoid r, but the absence in a series of examinations is of value in excluding the disease. nions appear to be divided as to the value of the reaction, some holding the positive tion to be of decisive importance, while others assert that the test is unreliable in a tive as well as a negative sense.

Fischer ("Zeits. f. Hyg. u. Infect.," 1899, XXXII, 407) holds, and with reason, that

Apathy, which is occasionally seen in children, is rare, together with subsultus, coma vigil, and stupor, so common in adults. On the other hand, meningitic typhoid (meningismus) may occur, or the typhoid bacillus may actually invade the meninges.

Gastro-intestinal disturbance is generally present from the beginning, but seldom in the form of severe diarrhea, and causes this disease to be readily confounded with pronounced and subacute disturbances of the digestive tract. The spleen can nearly always be felt, and is increased in size. It has actually been suggested to puncture this in suspected cases, and to examine the blood for the bacillus of Eberth! The rose spots will generally be evident before the end of the second week, and by this time the clinical picture is generally clearly marked. The most important feature, as in adults, is the temperature-range, with its morning remissions and evening exacerbations in steady progression to the characteristic gradual descent. During this period the diseases with which typhoid fever may be confused are meningitis, influenza, tuberculosis, enterocolitis, remittent fever, and even smallpox and trichinosis. In meningitis there are usually vomiting at the onset, marked headache, and tendency to retraction of the abdominal walls. In tuberculosis the temperature-range is irregular, there is rarely tympany, the belly is flat, and the delirium, when present, is apt to be wilder. Influenza strongly resembles typhoid fever, at least for a short time, but the febrile process is more abrupt, and the organic disturbances are more rapid and pronounced. Remittent fever in malarial countries is a large source of confusion with typhoid, and particularly so, where, as sometimes happens, typhoid fever is modified by the malarial poison. The ready examination of the blood for the plasmodium malariæ will at once make clear that element.

in all cases where the reaction has been positive, it should be shown scientifically that the patient actually had typhoid fever, by the demonstration of the presence of the bacilli, or that the patient had not within a reasonable period suffered from an attack of the disease, and that the proper dilution of the serum was used in the test. And, again, in the event of negative results, it should be clearly shown that the patient was not suffering from typhoid. In other words, it must be shown, on unimpeachable evidence, that the patient had or had not the disease. Cases of positive results are described by Ferraud, Kasel, Mann, and Fischer, which were evidently not typhoid. Busch, Schumacher, and Fischer describe other cases of unmistakable typhoid which gave negative results.

It would seem, however, from the cases at hand, that care should be had that the serum should be correctly diluted; also that the observation be particularly made of the paralysis rather than the clumping of the bacteria, and that, when possible, the tests should be controlled by bacteriologic examinations.

Solutions of the serum stronger than 1 : 10 may give the reaction, even from healthy blood. As a practical clinical point for control examinations, it might be suggested that pure cultures of the bacteria can be gotten from the urine of a majority of the patients, and this is especially so when the urine is found to be cloudy.

An exceedingly simple macroscopic agglutination test has recently been suggested by Bass and Watkins. M. V. BALL.

imple continued fever, a term much in use two decades ago, should robably not be recognized as a disease entity. Blood studies nearly lways reveal typhoid or paratyphoid agglutination reactions.

Prognosis.—As has been said, a statistical knowledge of the revalence of typhoid fever in children is exceedingly inexact, many ases escaping recognition altogether. The mortality among children s certainly low, some authors claim 3 to 4 per cent. In those of good igor, not weakened by previous disease or organic weakness, death s rare, and when it does occur, is liable to be due to some complication nd not to the disease itself.

Treatment.—The preventive treatment of typhoid fever is par-cularly important, because thoroughly controllable, but has to do ather with the subject of hygiene than practical medicine. Army xperiences in the British Army in the Transvaal and in the American rmy on the Mexican Border have amply demonstrated how valuable acterins are when used prophylactically. In the presence of threatened idemics, the public should be taught to realize the usefulness and rmlessness of the "typhoid bacterin" in prevention. The water-pply of cities ought to be entirely free from infection, and when this accomplished, typhoid fever will become rare. Summer resorts e particularly liable to epidemics of typhoid, where considerable owding of an alien population overtaxes local health precautions; nce it is wiser to make large use of boiled water or reliable bottled ters when not absolutely certain of the local supply. The same y be said of milk, in which the typhoid bacillus may readily appear d grow, the source of which is usually infected water or the existence typhoid fever among the milkers or the members of their families. e question as to whether typhoid fever can be aborted or not is wered in the negative by most authorities. In a suspected case early administration of calomel (gr. j to gr. iv) is a rational pro-ure, and is productive of no harm and possibly of much good if rted to in the first three or four days. Other intestinal antiseptics, bined with laxatives, may work with advantage. In no other ase is it more important to insist on absolute rest in bed from the suspicion to the very end of the specific process and perhaps a beyond—at least a week or two. If the child is away from the e where it can best be nursed—at its home or a hospital—it is to convey it there with all due precautions, even at some slight . A well-appointed hospital is best for rich or poor.

The *diet* must be regulated with the utmost exactitude as to kind, lity, and hours of administration. Only fluids are safe, and milk

in some form is the main reliance, and should be continued until apyrexia has lasted about ten days. It should be sterilized, Pasteurized or boiled, and this is afforded some slight variety of taste; in other way changes may be wrought by dilution, as with effervescent waters-Vichy, Giesshübler, or others. It may be variously flavored or modified by the addition of aromatic or diluent substances. Barley-wat and thin oatmeal water are often excellent additions. Unless the d gestive tract is in good tone, curds are liable to form in large masses a fats to collect in lumps, and thus irritate the intestine and work co siderable mischief. It is sometimes necessary to use only skimm milk; at other times cream and water. Where milk has seemed disturb the intestines, it is well to use only broths for a day or two, the raw whites of eggs stirred up in water, fruit juices, or whey. Aft the stomach has thus been rested milk may again be used, preferab predigested, alternating with some meat-juice or broth, and gradual thus get back to a plain milk diet. Much ingenuity should be exe cised with even these fluid substances, and the urgent petitions of t family to use solid food be smilingly put aside by concessions of th innocent sort. The addition of a few drops of brandy or whisky sometimes most grateful, and even of Maraschino or Jamaica ru Indeed, it is well to add a few drops of some spirits or of extract vanilla to the milk occasionally by way of a treat, and especially to t egg-water. The fermented milk known as koumiss is relished by so children, but not by all. Well-made vanilla ice-cream, is also a safe casional substitute. The amount of milk necessary varies considerab a pint a day being sufficient to support life, especially if it is well gested and diluted; a few days later it may be necessary to increase th and to decrease promptly if the food distresses. Three pints of mil day is the maximum, beyond which it is scarcely safe to go. This n be supplemented, however, by thin broths or replaced by more s taining meat-extracts. Many careful physicians allow for older child soft-boiled eggs occasionally; others use thin gruels or even milk-to For some reason or other, however, children have been disturbed w we have attempted these more liberal dietaries. Calf's-foot or w jelly has a solid or agreeable taste, and yet leaves no residue to irri the intestines. Junket or coagulated milk is also of value. It is o important to use some remedies to aid digestion; the normal HC absent in the height of the fever. The drinking of water should be couraged; to this may be added from five to ten drops of hydrochl acid to a tumblerful of sweetened water, as a not unpleasant disinf ing drink; this relieves the condition shown by dry lips and ton

which is more common among adults. If diarrhea is present, pepsin, along with the diluted sulphuric acid, is better.

The physician must bear in mind that relapses are due to two causes: one, not altogether under his control, a reinfection; the other, absolutely in his power, indiscretions in diet; and from this last also frequently arises sudden, unaccountable death. One week after all fever has ceased we may cautiously begin the use of more solid foods. Here the animal broths come in again, in which may be placed a few stale bread-crumbs, bits of toast, or Zwieback, thoroughly softened in milk or broths. A safe and very acceptable dish is a piece of not too tender broiled beefsteak, mutton chop, or chicken, which is to be masticated and only the juice swallowed; but the mere act of chewing is a great joy to a hungry child. This may be usually allowed from the beginning or middle of the second week. Then come scrambled eggs and scraped meat, rice- and milk-pudding, and finally the various bread preparations, carefully selected.

Baths.—For the treatment of the fever antipyretic drugs are to be avoided, the main reliance for lowering the temperature being upon cool or cold baths. There is no danger of the child taking cold when the bodily temperature exceeds 103° F. (39.4° C.). Cloths wrung out of cool water (80° to 60° F.), laid upon the body and head, will also be found grateful. A more effectual method is for the child to be entirely swathed in these, beginning with warm water at 95° F. (35° C.), and replacing by cooler and cooler water, 80° to 70° F.; or a piece of rubber cloth may be slipped under the child, the four sides propped up, and tepid (85° F.) or cool water (75° to 70° F.) poured in, forming a superficial bath. This is known as the wet-pack and should be continued for at least ten to thirty minutes. In hyperpyrexia with delirium the patient may be placed in a full bath with great advantage, or use the cold pack with iced water. Full directions for bathing are given in another place. The younger the child the less is he able to stand cold for a prolonged period. A bath of 85° is cold for a baby, and should be continued for a very short time. A child of twelve, on the other hand, may stand a bath temperature of 70° (Brand method). At all times the temperature should be carefully watched to see that we are not producing a condition of collapse; if so, or if the extremities grow cold, dry heat must be promptly applied, with stimulants by the mouth or rectum or hypodermically. Cold baths or applications are rarely contraindicated, except when there is a marked depression of the circulation or when a hemorrhage from the bowels is threatened, and then only

on account of the disturbance caused to the abdomen and intestines in the handling of the patient.

A valuable adjuvant to the cold bath in hyperpyrexias is the maintenance of a cool temperature in the room, by the free opening of the windows, even if the temperature of the room remains stationary at 60° F., and it is equally important that the patient should only be covered by a sheet or very thin blanket. In this there is no danger and practically no discomfort, so long as the child's temperature remains at or near 102° F. (38.8° C.). There is no stimulant for a "febrile heart" like fresh air.

Drugs.—Of the coal-tar antipyretics, antipyrin and phenacetin are preferred by some and acetanilid by others; guaiacol, locally, has many adherents, but its effect is transitory and should be carefully watched when applied. These drugs, though styled antipyretics should never be used in sufficient dosage to lower temperature. Phenacetin in gr. j to gr. ij doses may be used for the relief of nervous symptoms (meningismus, delirium, etc.). Quinin, if there is malarial complication, acts happily, but is capable of doing harm. If antipyretics are used, it is well to combine with them some stimulant or cardiac tonic, as strychnin. For tympany, turpentine by the mouth is perhaps the most satisfactory of all remedies. It may be used in enemata. The rectal tube is also of service. Where there is diarrhea also, the turpentine may be administered in conjunction with aromatic sulphuric acid, bismuth, naphthalin, salol, or a minim or two of tinctura of opium. It is sufficient to give turpentine (gtt. iij to gtt. vj in emulsion or in the white of egg) every four hours for meteorism, but to check diarrhea these and the other substances just mentioned should be given every hour or two while demanded, and the interval lengthened when this ceases. Tympanites may be combated also by the use of turpentine stupes, a flannel cloth wet with and wrung out of a mixture of one tablespoonful to a pint of hot water; by the internal use of thymol or turpentine; and when a grave complication, by hot enemata. If hemorrhage occurs, food must be withheld altogether for a time; when given, it should be in small amounts and cold, and an ice-bag applied to the right iliac region. As hemostatics turpentine or gallic acid act happily. One of the most powerful astringents, and yet a safe one, is acetate of lead. Collapse calls for powerful stimulants by the mouth, rectum, and subcutaneously—dilute alcohol, caffein, musk, camphor in sweet almond oil, 1:4, and caffein-sodium-benzoate are the best to employ.

Chloral is of value when insomnia or great excitement prevails, but

should the heart be enfeebled, croton chloral is preferable. Cold applications of iced water or ice-caps are very soothing, and the head should be kept as high as comfort will allow.

For constipation, which is as common as diarrhea in children, it is perhaps best to wash out the lower bowel twice a day with warm saline solution. Normal salt solution may be valuable, too, where there is diarrhea. To the rectal injections may be added turpentine or castor oil, or both.

If symptoms of perforation become evident, a surgeon skilled in abdominal section should be called in consultation, who, by prompt operation, may sometimes save life. Hypostatic congestion should be prevented as much as possible by shifting the position slightly, which is easily done by wedging up the mattress or the sheet an inch or two under the side of the child, eaving it so for an hour or more, withdrawing this and shifting the wedge, which may be a folded towel or a roll of cloth, to the other side, and raising it an inch or more; thus the attitude of the child is changed a little and the blood encouraged to gravitate obliquely in these successive directions rather than vertically. Anent of hypostatic congestion and the hypostatic pneumonia that its existence may favor, the toilet of the mouth is important. That is, the pneumonia results from a combination of the hypostatis (soil) and aspiration (exciting) elements. We permit all children with typhoid fever to chew chewing-gum, a plan long pursued at the Children's Hospital in Philadelphia. The mouth is so kept moist with saliva. We also use an alkaline or saline solution for cleansing the nose and throat twice daily. Pain in the legs frequently results from their long-continued extension, and is relieved by supporting the knees on a folded Turkish towel or small pillow. In our experience post-typhoidal surgical lesions have yielded almost theatrically to the employment of "typhoid bacterin." One boy, five years old, had two parotid fistulæ from each gland, an arthritis of the right knee, and a number of abscesses. His opsonic index was .76. Dr. Duncan studied the blood, and gave the injections of typhoid bacterin, beginning with 40,000,000. In six weeks the boy went back to Poughkeepsie, cured of his fistulæ and abscesses, and without his crutches and high shoe. He had suffered with repeated suppurative lesions for three years. He has remained well.

MALARIAL FEVER

Malarial fever, intermittent fever, fever and ague, chills and fever, and a number of other names are applied to a variety of febrile, specific,

and non-contagious diseases caused by the presence in the blood of a protozoon known as the hematozoon of Laveran, also called by Marchiafava and Celli the plasmodium malariæ. Clinically, the disease is characterized by extreme anemia, enlargement of the spleen, and by fever with periodic intermissions or remissions.

Etiology.—Malarial fever is very widely distributed and more or less constantly present throughout the known world. In America it is constantly endemic in certain regions, as in the Southern States and here and there in the Central States, especially in lowlands near the coast, along the edges of salt or partly salt estuaries, and less so on the Great Lakes. Its habitat also changes, appearing and disappearing under conditions recognizable or not. Again, the intensity of the attack varies considerably in different years, as does also the type of the disease. Swamp or marsh fever, as the disease is also called, receives this particular name because of its prevalence in low, moist, ill-drained districts, and it seems to bear some relationship to man's occupation or interference with the natural conditions of the locality, such as the forming of artificial dams and otherwise interfering with the course of natural waterways. Laveran says it is possibly acquired through drinking-water. (Probably because malarial mosquitoes perish in it.) It is coming to be universally accepted, however, that the malarial mosquito (anopholes, etc.) is almost the sole carrier of the plasmodia from host to host. Aërial conveyance, season, prevalence in swampy regions and along tide streams, etc., are all explicable on taking into consideration the habits and habitats of these pests. More than that, when regions are rid of mosquitoes, malaria practically ceases. The experiment at Oyster Bay and the wonderful application of modern sanitary methods in the Canal-zone of Panama have practically proved this generally accepted view. Outbreaks of chills and fever occur at special seasons, usually the late summer and autumn, although occasionally in the spring and early summer. Prevailing as it does in tropical climates constantly, the chief increments are in the spring and fall. Laveran originally made known to us the specific micro-organism which is now recognized as the exciting agent of malarial fever, and his researches have abundantly been confirmed by careful observers in this country and in Italy, also in Germany, South America, and India.

In this country and in Italy there are several distinct types of malarial fever: First, mild forms of more or less pronounced characteristics, divisible into tertian and double tertian fever and quartan fever and its combinations; and severe forms, more or less irregular, occurring chiefly in the later summer and autumn, including remittent malarial

evers, cases of malarial cachexiæ, and certain pernicious forms. In Italy these are exhibited in several forms, but here we see usually the tertian and quotidian type, and a special variety of micro-organism has been found to accompany each. The morphologic characteristics of the malarial parasite show it to belong to the class of protozoa containing a nucleus or one or more nuclei.

Types and Variations of Malarial Fevers.—1. *Tertian Type of Single Infection.*—This is the simplest form of malarial infection. A single group of organisms propagate themselves in the blood and reach the stage of segmentation at about the same time. It has been stated that the tertian type of organisms complete their cycle in forty-eight hours.

2. *The Quotidian Type.*—If we have what appears to be a full growth of the organisms each day, as judged by daily paroxysms, the quotidian type is exhibited. Examination of the blood from such a case shows two separate sets of organisms of the same class, but in different stages of development, the first maturing one day and the second maturing the next day following, and each producing a chill at the time of segmentation. This, of course, depends on a double infection occurring at different times. On the other hand, the group of the second infection may have been smaller than the first, so that we may for a period have only the tertian type until such time as the second group may grow to be of sufficient importance to produce a paroxysm. The second group may always remain smaller, and accordingly its paroxysm will be less severe, and it may also mature at a different hour. So we have the clinical picture of a case with tertian paroxysms in a few days becoming quotidian, the second paroxysm being lighter and at a different hour. (Double tertian.)

3. *Quartan Type.*—This depends upon the presence of malarial organisms growing to segmentation in seventy-two hours, and examination of the blood will show, if there is a single infection, one group of organisms. Every fourth day (two full days intervening) we have a paroxysm of from eight to twelve hours' duration, which shows very little tendency to anticipate or retard. Quartan infection may be double as well as single, so that we see an attack coming on two successive days with one intervening day subject to the same variations as seen in the quotidian, but examination in this condition will show two sets of organisms at different stages of development. Again, there may be a triple infection, so that the period of segmentation comes daily, and we now have a quotidian type, the nature of which only a blood examination will settle.

Paroxysms are essentially the same in both classes of infections, whether it is single, double, or triple, differing only as to severity, which depends upon the strength of the individual groups.

4. The *estivo-autumnal* variety differs from the foregoing types in its proneness to become pernicious, and depends for its origin on infection of the estivo-autumnal parasite. It presents itself as a quotidian, intermittent, and malignant tertian. It is quite irregular in its course, due first to the fact that the development of the different groups is not completed at the same time; segmentation is spread over a longer period of time (twenty-four to thirty-six hours), and there is a tendency to anticipate segmentation; and, secondly, to the factor of mixed infections. Should a quotidian intermittent fever present itself, we may be able to determine which type of disease we are dealing with only by a blood examination, and since the segmentation is irregular, we may clinically have at no time a complete intermission, but a remission and a chill again preceding the rise of fever.

There is also a malignant tertian, in which the temperature-curve makes a sudden ascent, remaining high for a number of hours, fluctuating but little, dropping part way only to rise again, and finally dropping to normal, the entire paroxysm often lasting thirty-six hours. There is a strong tendency to anticipation, so that the temperature may be continuous, presenting many of the severe constitutional symptoms which go to make up the clinical picture of typhoid fever.

Pathology of the Blood.—It is a very important and practical item of equipment for the physician to be familiar with the methods of clinically examining the blood in suspected malarial infection. The parasites found in the blood of patients suffering from malarial fevers belong to the protozoa. Different types of the disease present parasites with different characteristics. When the blood-corpuscles and the protozoa which they contain are studied, one skilled in blood examination can differentiate the form of the disease, the frequency of the paroxysms, and also foretell, from his knowledge of the life of the protozoa, the hour of the coming of the next paroxysm, provided, of course, he knows the hour of the last one.

The blood should be examined in the first stage in dried unstained films and in dried stained films, each possibly having certain advantages. However, we would recommend the use of both fresh blood and of dried, stained blood. In the fresh films we should use a small drop and avoid pressure. Such films may further be preserved by excluding the air by putting vaselin or wax around the edges of the cover-glass. The chief advantage of this method is that it gives an opportunity to study

the ameboid movements of the protozoa, and the disadvantage is that one must examine it very soon after withdrawal—at the most within three to four hours. The stained films give an opportunity for more careful study of the elements which are exhibited distinctly by the stain. Double staining with eosin and methyl-blue or eosin and hematoxylin, preferably the latter, is the most satisfactory. The method is the same as for ordinary blood examination. The blood should preferably be selected just before (an hour or so) the expected paroxysm, though it may be taken at any time. If it should be observed just after a paroxysm, the organisms are small.

The tertian parasite completes its life in about forty-eight hours, or less if there is any variation from this time. In the first twelve hours of its life the parasites appear as small, clear specks (hyaline bodies) in the red corpuscles, and if any pigment is to be seen, it is as very small granules. If stained, they appear pale blue. They are actively ameboid, and remain so for about an hour after withdrawal. In the next twelve hours the parasites have grown to about one-third the size of the corpuscle, are still ameboid, show fine granules, and the corpuscle has become paler. In the next twelve hours the parasites have taken up about two-thirds of the cell, have become less ameboid, the granules larger and moving. The parasites are now more irregular in shape, and the corpuscles larger and paler, the pigment granules standing out more markedly. In the next twelve hours all motion ceases, the corpuscles become shells, the centers of which are occupied by the parasites, and spore formation and segmentation begin. The organisms break up into fifteen or twenty round spores, at first contained inside the cell-wall of the red corpuscles, and then set free into the blood. It is at this time that the clinical paroxysm occurs. All hyaline bodies do not develop to the stage of spore formation, nor do all these spores—really the young hyaline bodies—which have been set free into the blood-serum reenter the red corpuscles, but the blood plasma in itself destroys many of them.

Should we have under observation clinically a quotidian form of malaria, the red corpuscles would show the tertian parasite but in two stages of development, one group being approximately twenty-four hours older than the other, of course depending upon the hour at which the paroxysms occur. This is due to a double infection. It must not be forgotten, however, that we may have a triple quartan infection that produces daily paroxysms.

The quartan parasite grows in seventy-two hours. In the first twelve hours it is a very small, unpigmented, slightly ameboid, hyaline

body, becoming in twelve hours more about the size of one-sixth to one-fifth that of the corpuscle, having taken on a few pigmented granules placed peripherally. In forty-eight hours it is one-half to two-thirds the size of the red corpuscle, round, as a rule, and possessing no ameboid movement. In sixty hours from the paroxysm it occupies nearly all of the corpuscle, which is neither enlarged nor paler than normal. In six hours more the pigment granules approach the center and are arranged like the spokes of a wheel, the first sign of segmentation. About three hours before the attack segmentation has produced from six to ten oval or pear-shaped bodies or spores containing pigment in their centers.

In multiple infections of this type we, of course, find the organisms in the blood in different stages of development.

Flagellated bodies develop after the blood is removed from the body, and consist of a central cell with arms thrown out. These arms are freely movable. In examining a fresh specimen, we may see such a body keeping up a constant ciliary motion and causing a disturbance in the arrangement of the red cells in its immediate neighborhood. The flagellated body does not often appear in either of the foregoing types of the infection, but is more common in the estivo-autumnal variety.

The second group of parasites belongs to the class of malignant or estivo-autumnal figures, and are divided into, first, the pigmented quotidian parasite; second, the unpigmented quotidian parasite; and third, the malignant tertian.

The pigmented quotidian parasite completes its cycle in twenty-four hours. When seen in the blood-corpuscle, it appears as a small, actively ameboid, hyaline body, rapidly becoming pigmented and quiet, the pigment lodging in the periphery of the organism, after which it breaks up into spores. It has been pointed out that segmentation of this type does not take place in the peripheral blood, but occurs in the spleen and bone-marrow. The pigmented organism occupies one-third of the corpuscle, which is shrunken, if changed at all. After the infection has lasted for several days crescents appear.

Crescents are always an evidence of estivo-autumnal fever, and never occur in the quartan or tertian type. They are from eight to ten micromillimeters in length and from two to three micromillimeters in breadth, are half-moon shaped when typical, but vary greatly, oftentimes appearing almost straight. They contain pigment, sometimes scattered, but oftener found clumped in the center, and usually without motion. With a good light and an accurate adjustment the shell of the red blood-corpuscle can be seen extending from the poles

of the crescent, showing that this parasite is distinctly an intracellular formation. Crescents are distinctly an evidence that the infection has lasted a number of days—five or six—and they will not be found in any specimen before that time.

The unpigmented quotidian shows not many variations from the foregoing type, except that it is free from the pigment, though the crescents formed from this variety may show pigmentation.

The malignant tertian parasite is pigmented and, in fact, much like the pigmented quotidian. It grows to segmentation once in forty-eight hours, and is ameboid in the advanced stage; the pigment is active and the entire organism is larger. Probably no better idea can be given concisely of the different characteristics of these parasites than by reproducing the table of Mannaberg's. (See p. 884.)

Pathologic Anatomy.—In the milder forms of malarial fever there are very slight characteristic changes. In the chronic forms there is a malarial cachexia, of which anemia is the chief feature, with enlargement of the spleen, thickened and adherent capsule, and dark color, showing fibrous thickening throughout. The spleen is always large in malarial fever (acute splenic tumor), the parenchyma is cyanotic and the organ may actually undergo rupture. In chronic malarial cachexia the "ague cake" spleen is present. Thayer says, "without enlargement of the spleen there can be no malarial cachexia." The liver is generally enlarged, and gray or slate-colored rather than brown. In death from pernicious malaria the brain may show some edema under the pia, with evidences of hyperemia and occasionally punctate hemorrhages, possibly due to granular or fatty degeneration of the endothelium of the vessels. The malarial parasites may be found in profusion in the cerebral capillaries. In both these organs the capillaries are filled with leukocytes, and many malarial parasites can be found. The kidneys show relatively few plasmodia. The blood changes have been described at length.

Symptoms.—The milder forms of intermittent fever—those which are commonly seen in the temperate zone and warmer countries, especially in the spring and early summer—are the tertian and quartan fevers, each with certain variations. Tertian intermittent is the form usually seen in this country. The quartan is very rare, and may be differentiated by blood examinations. The outbreak of fever and ague is due to the invasion of the blood by a specific organism, which passes through its cycle of existence in forty-eight hours. The febrile paroxysm occurs when the protozoa reach their height and begin to segment, the process repeating itself with much regularity at intervals of forty-

MANNABERG'S TABLE

		Duration of the disease	Movements	Pigmentation	Maximum size	Form of spore formation	Number of spores	Crescent bodies	Alterations in the infested blood-corpuscles
Simple Intermittent Fever.	Quartan parasite.	Seventy-two hours.	Small movements in immature forms.	Coarse granules, little or no movement.	Size of red blood-corpuscle.	Daisy form, single spores, round, with distinct nucleolus.	6 to 12.	None.	Red blood-corpuscles are little discolored and do not alter their size.
	Ordinary tertian parasite.	Forty-eight hours or less in anticipating cases.	Active ameboid movements in immature and also in middle-aged forms.	Fine granules in immature forms, often in the larger, actively swarming.	Size of red blood-corpuscle; sometimes larger.	Sunflower or grape-like, single spores, small round nucleolus, rarely seen.	15 to 20; often less.	None.	Red corpuscles are often hypertrophied, and lose their color quickly and completely.
Malignant or Estivo-autumnal Fever.	Pigmented quotidian parasite.	Twenty-four hours.	The unpigmented immature forms actively ameboid, less active when the pigment accumulates.	Very fiine, later coalesced in one or two lumps. Does not swarm.	One-fourth to one-third the size of red blood-corpuscle.	Irregularly formed heaps.	6 to 8; often more.	Present.	Red blood-corpuscles often shrink, and are thin, either take stain copper-colored or may be completely decolorized.
	Unpigmented quotidian parasite.	Twenty-four hours or less.	Very active, ameboid movement.	None.	One-fifth to one-fourth the size of red blood-corpuscle.	Star-shaped or irirregular heaps.	6 to 8.	Present.	Red corpuscles shrink frequently and are darker stained.
	Malignant tertian parasite.	Forty-eight hours.	Active movement remains present in pigmented bodies.	Moderately fine; often shows the oscillatory movement.	One-half to two-thirds the size of red blood-corpuscle.	Irregular heaps.	12 to 24; rarely, 32 or 36.	Present.	Red blood corpuscles shrink frequently, and are darkly stained or may be perfectly colorless.

t hours. In very young children the stage of chill is replaced by e restlessness, cyanosis, and cold extremities, with yawning, nausea, possibly diarrhea, and along with these various motor nervous enomena—twitching or convulsions. In the second or hot stage the er may rise very high—to 108° F. (42.1° C.); the child is restless, irsty, and the face is flushed, the skin is hot, the eyes are injected, ie pulse is full and rapid, severe pain is felt in the head, back, and mbs, and the urine is scanty and of dark color. This febrile condition emains for an hour or two, gradually falling, and a profuse sweat ollows. In this stage the fever and pain gradually subside, and the atient falls asleep, from which he awakens feeling well. In older hildren, beyond six or seven years, the paroxysm is very similar to iat in adults, chills, fever, and sweating being well marked. Fever ıay reach 108° F. (42.1° C.), lasting from a few minutes to an hour.)uring the stage of the fever there are great thirst, dryness of the skin, retfulness, headache, and, possibly, also a repetition of the digesive disturbances. Finally comes the stage of sweating, immediately ollowing which there is evidence of exhaustion, but soon after prompt eturn to ordinary health. As in most other acute febrile processes, nstead of the chill occurring as in adults, the child suffers a convulsion. ometimes the first symptom (so well remembered by one of the authors uring a long attack of intermittent fever) is scarcely recognized chilliess; if accompanied by blueness of the nails, it means the onset of a aroxysm. If, as rarely happens, the case is one of pure tertian fever, he child seems absolutely well on alternate days. A marked cachexia ıay follow all forms of the disease, or accompany cases treated inadeuately, or wherever the sufferer has become subject to repeated ttacks. Here the fever may be slight or scarcely recognized, but the hild exhibits a woeful appearance, with pale, sallow skin, pinched atures, sunken eyes, irritable digestion, and recurrent diarrhea. ernicious malarial fever, rare in temperate climates, exhibits the ordiıry phenomena greatly intensified, especially the neurosal features—nvulsions and pupillary changes, passing into coma and collapse or ath, with possibly little or no rise in temperature. Bronchitis is a mmon complication, and acute coryza has been known to replace the eating stage. In children it is usual to note disturbances of the mentary canal as the most conspicuous feature of the infection. arrheas are probably due to secondary infection in children whose ılth has thus been lowered. There is little disturbance of circula1, except the vasomotor changes seen during the paroxysm. Slight uminuria is observed occasionally, and hematuria rarely. Jaundice

is not a rare phenomenon ("bilious remittent fever") and malaria should always be taken into consideration as one of the causes of hematogenous jaundice. One of us has seen a number of such cases and has described one. A number of organic complications are alluded to, and doubtless are the results of malarial infection, but not directly due to it; they are rather evidences of devitalization, blood dyscrasia, and lowered resistance. Irregular forms of malaria are quite the rule in childhood.

Diagnosis.—The periodicity of the attacks, requiring careful observation to determine; the enlarged spleen, which always occurs; and, finally, the presence of the malarial organisms in the blood, will render the diagnosis of malarial fever, even in children, most complete. Osler says that widening experience strengthens the conviction that the value of Laveran's discoveries of the hematozoa, demonstrable in the blood, is only secondary to the finding of the bacillus of tuberculosis by Koch. It is not always easy to make the diagnosis from the clinical picture. The commonest type is the double tertian or quotidian fever. But regular types are not the rule in young children. All sorts of remittent and continuous febrile manifestations may be observed. The disorder most likely to be confounded with this is tubercular infection. It must be remembered, however, that the one may be superadded to the other. The greatest difficulties in diagnosis occur in the more irregular and remittent forms and in the malarial cachexia. Here there is the inevitable confusion outgrowing from the disturbed organic activities, of which malarial fever may have been the cause. Certainty can only be reached by blood examination or a practical conviction by the less scientific but easy method of applying the therapeutic test—giving quinin and noting the result.

The **prognosis** of malarial fever is good in this country, if recognized and adequately treated; but occasionally estivo-autumnal fever is seen in the southern states or is imported from them to other sections of the country. Mild cases often go on to spontaneous recovery. In severer cases the intensity of the outbreaks gradually diminishes and anemia or a chronic cachexia becomes established; or, again, the paroxysms may augment, pass into the pernicious type, and produce collapse and death.

Treatment.—Prophylaxis is the most important measure and will accomplish much in modern sanitation and individual care. The former measures for the destruction of larvæ and obliteration of breeding places for the malarial mosquito can scarcely be dealt with here. Keeping the child indoors after sundown in a malarial locality, espec-

y when the disease is prevalent, as during spring and fall, is impera-e and efficacious. Bedrooms should be upon the second floor, at ıst—as high up as possible, and as Koch found in Africa, mosquito-tting is even a more sure protective than quinin. In quinin we ossess one of the real specific drugs, and by its use we may confidently xpect complete recovery in cases of malarial fever. The exceptions ıre rare, and have to do rather with individual hypersusceptibility to the drug or impaired organic activity. The best time to give large doses of quinin is in the eight hours preceding an expected paroxysm (H. C. Wood), and it is usually well to do this and follow with regular doses of one or two grains (0.065 to 1.13 gm.) three times a day in children under six years of age. George Dock, however, emphasizes the following points, which are in the main embodied in the foregoing treatment:

1. In tertian, quartan, or any duplicated form of these parasites the quinin should be administered in the decline of the paroxysm or before the end of apyrexia. The record of the temperature taken at frequent intervals is a very available and safe guide to the time of administration of the drug. A full dose of the drug, in the form of the hydrochlorate, is administered in capsules. This is followed after a short interval by fifteen drops of dilute hydrochloric acid.

2. In the estivo-autumnal form, where the thermometer fails to show regular remissions, the symptoms being severe, the immediate administration of full doses of the drug is demanded. The fall of temperature or a marked improvement in the subjective symptoms following the full effect of the drug will indicate further treatment, after the manner of the ordinary tertian infection.

3. To prevent relapses a prophylactic dose of quinin should be given every fifth or seventh day following recovery—*i.e.*, every seven days following a mild tertian; every five days following a severe infection.

4. The general consensus of opinion is to the effect that hematuria in malaria is not a contraindication to the use of quinin. Its cautious administration in small doses in such cases is certainly indicated until we have more positive knowledge that it exercises deleterious properties.

Clinically we have found H. C. Wood's views of signal value. We give relatively large doses to children: for instance, to a child five years old we would give two grains of the hydrochlorate every hour until eight doses were given. If no paroxysm occurred we would reduce the next daily dose to seven administrations of two grains each, the following day six doses, the next five doses, and so decrease a dose a day until three doses were given daily. This dosage, usually two grains

before each meal, we would continue for one week more. After this a full dose (12 to 16 grains) is given on one day of a week for several weeks.

For sudden effect or in pernicious cases quinin should be given under the skin: A form recommended for this is the muriate of quinin with urea. In ordinary cases it is better to give the drug distributed rather than in one large dose. The difficulties are in its disagreeable taste and its tendency to produce irritability of the stomach. The best way is to have the quinin in powder and give it in simple elixir, mixing the dose in each instance just before taking. In infants or where the drug is not readily accepted it may be given by the rectum, at least doubling the dose by the mouth. The writers have found that quinine suspended in cocoa syrups, several of which are on the market, are very reliable preparations. Most of them contain two grains of the sulphate to the dram of liquid. Children take them with avidity. Jacobi says if the attack comes on at regular intervals quinin should be given at a single dose two or three hours before the attack, a dose of five grains sufficing for a child of three years. In attacks occurring at irregular intervals there should be given enough, and a little more than enough—from eight to ten grains in three or four doses during the day. The neutral tannate of quinin is free from much bitterness, but requires two and a half to three times the dose of the sulphate. Euquinin we have not used, but there are many laudatory reports concerning its value in children. For rectal administration no acid should be used, and the better form is the bromid, the muriate, the bisulphate, or the carbamid, and in the form of a suppository. Ointments are uncertain or valueless, but in extreme cases of susceptibility may be tried with lanolin.

Damonski reports very favorable results from the use of methyl-blue, ten cases out of eleven terminating in recovery by its use. H. C. Wood, Jr. also reported favorably upon the value of this drug. He used the drug for forty-eight hours at a time, and thus subjected the parasite at every stage of its development to the action of the drug. In chronic cases Warburg's tincture has been especially recommended.

Brodnax has found acetanilid a very useful agent to abort the chills of malarial fever. This drug acts well with quinin in some cases. While administering quinin, calomel in minute divided doses is a good adjunct to unload the upper bowel and thus open the way to the absorption of the drug.

TETANUS

Synonym.—Lockjaw

Tetanus is an acute infectious disease of the central nervous system, aracterized by continuous tonic spasms, with marked exacerbations, fecting, as a rule, the muscles of the jaw and the back of the neck. here are at times also clonic movements. There is much ground for elief that the primary predisposing cause of the trouble is always an injury, through which the bacilli of tetanus enter and infect; also some avoring condition of the wound or some concurrent infection, or both.

Etiology.—The direct cause of tetanus is the bacillus of Nicolaier, slender rod with rounded ends. Tetanus occurs about five times as ften in males as in females, a fact which emphasizes the necessity of a raumatism as the instrumental cause. It occurs most often between he ages of ten and forty years, but may arise at any time of life. The etanus of the new-born begins, as a rule, between the fifth and tenth lay after birth, thence up to twenty days. The entrance of the acilli here is by way of the umbilical cord, and it must be admitted s possible that other toxic agents may thus irritate the nerves of a ewly born child. Colored persons are more subject to tetanus than hite; the filthy much more than the clean, everywhere. Puerperal etanus is rarely seen where modern surgical principles prevail, in bstetric as well as in surgical practice. The feeble are no more ubject to tetanus than the robust. Tetanus may follow the greatest ariety of injuries. Punctured and contused wounds of the hands and eet are supposed to be most liable to this infection, but it may follow pon many minor injuries. Gunshot and other Fourth-of-July ounds are particularly dangerous. It is more common in very arm than in temperate climates. Sandy shores, as far north as ong Island are favorite sites for the growth of the tetanus organism. he tetanus bacillus thrives in the soil, and in sandy localities the ecaying animal matter (shell fish, etc.), furnish exceptional condi- ons for its growth. Manure heaps, stable-yards and the stables emselves are other danger localities in which to sustain wounds.

The development of tetanus requires usually a few days, but may cur soon after an injury or operation, more chronic cases take from e to two weeks and may take four.

Pathology.—The essential pathology of tetanus is not yet demon- ated; in fact, no characteristic lesions have been found either in d or brain. Rigor mortis sets in almost at once. Congestions in ferent parts and granular changes in the nerve-cells have been

demonstrated. The cause of the malady is the bacillus of which is found in the soil and the dust of dwellings. It is sh like a stumpy pin, and is capable of resisting great heat for a These bacilli produce several poisons, tetanin, tetanotoxi toxalbumins, which attack nervous tissue. Oxygen is de these bacilli, which helps to explain why cleanliness l action. Bacteriologic researches have helped enormously results and guide in the treatment. Behring and Kitasato onstrated the fact that the blood-serum of tetanic animal immunity in others, and the animals thus rendered im powerful antitoxic qualities, producing curative effects.

Symptoms.—There may be some prodromes, sometin indistinct pains about the injured part, or a dull headacl first distinct symptom is a feeling of tightness in the jaws, mastication, and a gradual stiffening of the muscles of the and lower extremity, until opisthotonos is produced, or of th these are firmly clenched (trismus). Later, the legs becom the arms escape, as a rule. The muscles of the face assume a istic contraction, especially about the mouth, giving rise to grin or smile. ("Risus sardonicus.") Now and then is associated with paralysis of the facial muscles. Alon muscular contractions is pain. The contractions of th muscles and the diaphragm may imperil life by i with breathing Swallowing is also rendered difficult muscular pains grow worse and worse until the child is All this may cease during sleep, but on the instant ing the distress returns with full force. The pulse is rapid possibly due to vasomotor involvement. The temperature va in some instances it may remain normal throughout, in othe two or three degrees. Sometimes it runs very high, to 108° and is probably then due to an intense effect of the toxins ci the blood upon the heat centers. Thirst is often great, agg the profuse perspiration and the difficulties of swallow Urination is irregular, and the bowels are generally c Death, when it occurs, is usually from failure of the heart o from spasm of the glottis, or exhaustion from the difficulties ing food. Most cases die within a fortnight, usually in f days. If the patient survives the first two weeks, recove looked for. In tetanus of the new-born those cases in which occurs are most rapidly fatal.

Diagnosis.—The diagnosis of well-developed cases following external injuries is easy. Tetanus may be mistaken for hydrophobia, but in this there is no trismus and always a history of dog- or other animal-bite, and the spasms are produced only on attempting to swallow. From tetany a diagnosis may be made by remembering that in this the mode of onset is from the periphery inward, and also through Trousseau's sign, (a spasm brought on by pressure on the large nerve-trunks and arteries of the extremities affected). Strychnin poisoning also resembles tetanus, but never begins with trismus. There are also much more rapid development than in tetanus and pains in the stomach, the primal rigidity being in the extremities and posterior neck muscles.

Prognosis.—The mortality in tetanus is 85 per cent. in traumatic cases, in idiopathic under 50 per cent. A favorable symptom is the length of interval between the injury and the first spasms. Much hope is aroused by the discoveries of Behring, particularly in the matter of immunization, and in the more chronic cases.

Treatment.—The treatment of tetanus consists in prevention. Wounds which are made by the surgeon are under absolute control and should not be a source of infection. Wounds of hands and feet incurred by accident should be treated antiseptically at once, by pure carbolic acid.

If the wounds occur around stables or on the seashore, or if they are incurred from fire-crackers, torpedoes or toy-pistols, the necessity for such precautionary measures is increased. Under these conditions, the patient should also receive a prophylactic dose of antitetanic serum. Fourth-of-July sequals have become much less common since the splendid campaign carried out by the "Journal of the American Medical Association." If tetanus sets in, general measures must be instituted, bearing in mind the exalted state of motility. Quiet, darkness, and isolation should be secured. All moving and handling and feeling the patient should be done gently and slowly. If the jaws are locked, a wedge may force the teeth apart to introduce food by tube or otherwise. If this fails, the tube can be passed through the nose, or rectal feeding may be employed.

To limit the spasm, chloroform inhalations are very useful, also nitrite of amyl, which may cause the spasms to be greater at first but lessened afterward. Chloral hydrate helps to produce sleep, and may be administered by the mouth, rectum, or hypodermically; five to fifteen grains may be given at once and repeated several times a day. Opium and morphin are also most helpful. Curare, calabar bean, Indian hemp, belladonna, and other drugs have been much used and

Etiology.—At the present day the plague is practically confined to Asia, but since 1850 it has appeared occasionally in Europe, Asia and Africa. The Mediterranean basin and the strip of country running parallel to that sea across the Continent of Asia, from Turkey to China, has been its habitat during the nineteenth century. It may prevail in any climate and latitude, and in any season of the year. Moderate temperatures combined with dampness favor its propagation. The prodromata of the affection may appear before an outbreak, during a period varying from a few weeks to several years, as buboes with fever, and in a more or less epidemic form. This disease is readily inoculable and is undoubtedly contagious, but the intensity of its virulence is greatly modified by free ventilation and attention to hygienic rules. The channels by which the plague may be acquired are the alimentary canal, the respiratory tract, and the skin. The localities in which the disease seems to be endemic are those where we observe conditions of poverty, overcrowding, and neglect of the common hygienic precautions.

Among the lower animals, the rat seems most liable to be attacked. Rats thus suffering from or dead of the plague may infect other animals that consume them, and, in addition, rats are always affected by a disease similar to the plague at the same time that man suffers. Indeed Daniel Defoe in his remarkable "Journal of the Plague Year" described the existence of the disease among rats: but it became another triumph of the present century to detect that the *flea* was the carrier or intermediary between rat and man and man and rat.

The disease is commonly fatal in children, but not in nurslings, many or whom survive their mothers. In children the adenitis is usually most pronounced about the cervical and nuchal region, by extension from lesions in and about the mouth. In children, too, there are cases with no recognizable buboes, especially in the later stage of an epidemic type (Dr. Arnold, U. S. N.).

Specific Organism.—On the fourteenth of June, 1894, Kitasato and Yersin, working at the time of the epidemic at Hong Kong, demonstrated the specific organism of bubonic plague. It is described as a diplococcus inclosed in a delicate capsule, and a short bacillus with rounded ends and a clear space or band in the center.

An interesting fact, demonstrated by some figures drawn by Woodhead, is an apparent development of the bacillus after death, similar to the development of the flagella of the plasmodium malariæ some half an hour after removal from the body. There has been nothing definite determined respecting the influence of heat or cold, dryness or

lague. It comes on insidiously, the usual premonitory symptom being ain in the side, followed by difficult and embarrassed respiration, ough, and the expectoration of a bloody, tenacious mucus which, nder the microscope, is found to contain the bacillus pestis in great rofusion.

Prophylaxis demands that a community threatened by bubonic lague houseclean and exterminate the domestic rat.

Treatment.—The most successful curative treatment is by the use f the antitoxic serum perfected by Yersin. This, if used early, will orestall the heart failure so common, and the buboes soften and isappear without suppurating. The use of this serum has been dis-ppointing in the Orient, but in Oporto it has, according to Calmette, educed the mortality to almost nothing.

The moment plague breaks out in a dwelling the patient should be emoved to an especially constructed hospital. Persons who have een in active contact with the infected and all persons in the dwelling nd houses adjacent should be removed to special camps, and be etained there for at least seven days, and subject to medical inspec-on once or twice daily. Should any of the "contacts," as the exposed ersons are termed, develop plague, the building or tent must be acuated, disinfected, or destroyed. They should be inoculated by affkine's prophylactic, and if so, they are exempt from plague rules r a period of six months. Active campaigns should be instituted ainst rats and insects.

Should the bubonic plague visit our shores, we have little to fear m it. In bygone epidemics, when it destroyed its victims by ousands and even millions, it found a congenial soil in the filth and ualor of the middle ages or the barbaric habits of the homes of the r East. Our greatest safety lies in the sanitation of our cities; and in e event of an outbreak, we have a second line of defense in the ap-ication of that brilliant discovery of modern science—serum therapy.

GLANDULAR FEVER

A disorder called "glandular fever," occasionally epidemic, has n described by several writers, especially by E. Pfeiffer, in 1889, O. ebner, and others since. West and Hamill have written interest-ly upon its occurrence in this country. These views have been criti-d, and no mention is made of this disorder in many recent text-ks, but, on the whole, the testimony is fair that a special disease of inct individuality exists, characterized by fever and swelling of the

lymph-nodes. The disease is usually unilateral at first; later symmetric. With the involvement of the first gland there is usually a sudden rise of temperature to 103° or even 105°. After several days, this fever disappears by crisis. With the involvement of the glands of the opposite cervical chain, the temperature rises again to fall once more by crisis. The second febrile excursion may be less marked and of shorter duration than the first. The lymph-nodes are hard and extremely tender. There is little or no edema of the adjoining tissues nor does suppuration occur. Nephritis occasionally follows, from which prompt recovery is the rule. The cause is not known, but contagion is almost certain. In diagnosis there must be excluded such causes as the commoner infections of mucous surfaces and sympathetic glandular irritations.

RHEUMATIC FEVER

Synonyms.—ACUTE RHEUMATISM; ACUTE ARTICULAR RHEUMATISM; INFLAMMATORY RHEUMATISM

Acute rheumatism, or rheumatic fever, is an acute infectious but non-contagious disease, depending upon some infective agency or group of agents and characterized by a wide-spread inflammation of the joints with a peculiar tendency to affect the heart. In children the other serous membranes are as likely to become involved as the articulations. As seen in early life its joint manifestations are often slight and atypical.

Etiology.—The causes of rheumatism have been explained in the past by one of three theories: (1) That it depends upon a morbid entity, the result of defective assimilation, the product of which is lactic acid, or certain combinations of it; (2) the nervous theory (J. K. Mitchell), according to which either the nerve centers are primarily affected by cold and the local lesions are atrophic in character or that this nervous disturbance brings about hurtful metabolism, so that the nitrogenous products, instead of being converted into urea, are transformed into uric acid and other poisonous products which cause the symptoms. Both of these theories have been discarded by those who have made studies of this interesting problem in recent years. (3) The germ theory, claiming a specific microbe as the cause of the joint inflammation, the analogy of which is well marked in the septic processes, gonorrhea, and scarlet fever.[1] If one is impressed by the

[1] Various observers have studied the subject, notably Herman Sahli, Leyden, Achalme, Riva, Triboulet and Coyon, Singer, Jaccoud, Poynton and Paine, Longcope and others. Achalme's bacillus, an anaërobic, more or less motile rod, like the anthrax bacillus, is shown to produce symptoms of rheumatism.

force of such analogies, Imbrahim says: "Probability becomes a certainty when we observe the clinical phenomena, the complications relative to the endo and pericardium, the pleura and the skin." Two very interesting problems arise, however: 1. Is the disease dependent upon a bacteriologic entity (diplococcus rheumatica) or is it a symptom-complex that may be caused by a number of infective agents? 2. Is there an actual septicemia or are the toxins responsible for the joint and other serous membrane affections? Neither of these questions is definitely settled. Heredity has an important relationship to cause in two-thirds of the cases. Whatever be the poison, it has a selective tendency for fibrous and serous tissues. The immediate cause is rapid cooling of the surface, in most instances, or changes in the weather beyond our ordinary means of recognition. It is essentially a disorder of young people and relatively common in children, although the cases described in infancy belong to different affections, the arthritis of sucklings, various specific arthridides, etc. Indeed, the disease is exceedingly rare in infancy. Miller could find but nineteen cases in an exhaustive search of the literature. In the young a potent cause is predisposition or inheritance. Children under five years are readily affected, and instances are recorded in babes of one and two years. The disease becomes far more common between the fifth and the tenth years, and is most common between the ages of ten and twenty. By far the larger number of cases arise in the spring, and one attack predisposes to another. The seasonal relationship has been particularly noticeable in England and America. The predisposing influence of damp, ill-lighted and unsanitary dwelling houses has also attracted attention in nearly all lands. The disease is more common among the poor than in the better walks of life. After puberty males are attacked more frequently than females; but this sex disproprotion is not noticeable in the earlier years. Indeed, in Holt's series, girls were more frequently affected.

Tonsillitis often occurs as a precursor to rheumatism or acute arthritis, and it is undoubtedly occasionally followed by acute endocarditis. Packard regards these cases of endocardial inflammation which follow tonsillitis as cases of irritation of serous surfaces by germs or their toxins entering the circulation from the inflamed tonsils. Menger views the oral cavity as the point of entry.

Morbid Anatomy.—The synovial membranes of the joints and ligaments become injected, and effusion of a turbid fluid takes place into them and the surrounding tissues. Minute hemorrhages into

or without painful states, working serious damage, or at any moment latent disturbances may become apparent. The temperature ranges from about 101° to 101.5° F. (38.3° to 38.5° C.).

Pericarditis is not so common in children (according to Imbrahim in 10 to 20 per cent. of cases), and is rare under seven years of age. The existence of this is more difficult of recognition than the endocardial lesions, though they may coexist. The symptoms of a beginning pericarditis are most varied in character and degree. They may be so trivial as to pass unnoticed, or cause horrible distress. Nevertheless, we firmly believe that most cases of pericarditis would be recognized, were the attending physician cognizant of its various physical signs and properly apprehensive of its occurrence. We might cite a number of interesting cases from our own experience; but will rest content with the following:

Miriam C—, seven years of age, was seen by one of us in consultation. He had been asked to see a case of postdiphtheritic paralysis. It was found that the initial angina had been by no means characteristic, nor had sufficient time elapsed to expect paralysis. An examination revealed a well-marked pericardial friction-fremitus and a to and fro sound at the base, and the interesting further find, that the child did not move her legs because of the pain and tenderness in her knee joints. She made a very prompt recovery under the administration of salicylates, but had several recurrences that left her with a crippled heart.

Sir R. D. Powell is of the opinion that the more dangerous heart lesions, mitral stenosis and aortic regurgitation, rarely occur in primary attacks, but are the results of slow deforming valvulitis. Pneumonia is an uncommon complication, and when present, is not so much shown by cough and expectoration as by localized dullness and sudden increase of temperature. Pleurisy, single or double, is of frequent occurrence. When single, it is liable to be of the left side and thus imperil the pericardium. Chorea, which is very closely allied to rheumatism in childhood, generally shows itself, if at all, toward the end of an attack, upon the subsidence of the more acute symptoms. Chorea may begin at the height of the rheumatic process, and when it does, there has probably been a beginning of cardiac involvement, and it is most likely to arise in nervous, emotional children. Rheumatic children are frequently attacked with an acute tonsillitis, appearing much like diphtheria or the throat inflammation of scarlatina or influenza. This pharyngitis may be the first symptom of rheumatism, or it may occur in its course, and is rarely followed by suppuration or

be said to exist in name alone. Jacoby called attention to the joint manifestations years ago; but it is principally due to the : of English authorities (Cheadle, Gee, Barlow, Poynton and ıe, etc.) that our present conceptions are due. Cheadle lays great s upon different rheumatic series: Thus, one child may have in ience chorea, endocarditis, acute articular rheumatism; while her displays a totally different sequence. We must refer the ent to his writings. Lastly, we should scarcely do justice to this ject were we to neglect to mention Dunn's statistical studies. work goes far to support the evidence of English authorities.

Diagnosis.—In the rheumatism of children, as has been pointed arthritis is relatively mild, the cardiac symptoms most severe; joints may present little more than a stiffening, with tenderness ı pressure or upon active or passive movement. In children ıts and pyrexia are less prominent. The hemorrhagic and vasomo- henomena, purpura, erythema, and pleurisy are more in evidence. hildren various phases of rheumatism may arise independent of another. The diagnosis will need corroboration by estimating ly tendencies, such as recurring attacks of tonsillitis or a history of matic seizures. If the heart be found affected or the characteristic ıles or erythema be seen, or a history is furnished of antecedent ea, along with multiple painful involvement of the joints, fever, sweating, then we may be sure of our diagnosis. The heart must vatched unceasingly, and often gives little evidence of a growing age. The symptoms of scarlatinal arthritis are so like those of ımatism as to be indistinguishable from them unless there be some ling symptoms. The difficulty may be increased further by the ırrence of true rheumatism in the course of scarlet fever. Gon- eal arthritis may also occur in children.

n epidemic cerebrospinal meningitis the joints sometimes become nder as to be mistaken for acute rheumatism. Violent headache, m of the neck muscles, and the lumbar puncture studies prove sufficient for differentiation. There are many conditions ng in children, accompanied by tenderness of the joints, which ld be borne in mind; among these are pyemia, scurvy, some litions of syphilis, scrofulous arthritis, the pyemic arthritis of nts, gonorrheal arthritis and pneumococcic arthritis.

Course and Duration.—The complications of rheumatic fever ıildren influence largely its progress and curability. The duration es from ten days to three weeks in the well-established cases, and be marked even then with fresh outbreaks of varying severity.

other cerebral symptoms appears, prompt and vigorous antipyr should be employed; here the cool (80° F.—26.7° C.) or cold (60 50° F.—15.6° to 10° C.) pack is valuable, with a few well-dire doses of acetanilid or antipyrin, carefully watched. To secure t quillity of mind and body the bromids are useful, though depres especially useful are the bromids of lithium, sodium, or stront Few things are better here than small doses of opium, such as the t of McMunn, Dover's powder, or codein. Quinin or the salicyla cinchonidin sometimes acts most happily as an auxiliary mea especially when the temperature attempts to run high, which is like be the case where there is endocarditis or pericarditis. Five to grains a day should be given to a child five years old. For the l complications full doses of opium with or without brandy or whisk recommended by DaCosta, Powell, and Cheadle. When exuda arise, as in the pleura or pericardium, the iodids are especially valu For imminent heart failure, shown by a feeble first sound, small irregular pulse, the hypodermic use of strychnin with brandy and italis is urged by Cheadle. It is well to avoid the use of syrups as strua, because of their tendency to produce acid in the stomach, an rather a few drops of compound tincture of cardamom, which, wit alkalies, make a sweetish mixture, with or without a little glyc Simple elixir or essence of pepsin also answers very nicely. Co lescence needs special attention. Because of the anemia, it is w give nitrogenous foods and the green vegetables. Iron is also ne by nearly all cases.

Preventive treatment is exceedingly important and has large sibilities. Children of rheumatic parents, or who have had thre ings or mild attacks, should have the utmost attention given to th giene of their skin, and become accustomed to regular cool or bathings. Nothing is more valuable than this. After the bath the should be thoroughly rubbed, and, if not too tender, with a rough towel, or a towel dipped in brine, rough dried, and kept fo purpose. If the skin be a leaky one, a little diluted alcohol, or spi camphor or aromatic vinegar, may be applied. The skin mu promptly protected by clothing immediately after the bath and other times. After exercise or overheating, children susceptil rheumatic attacks should be dry rubbed in a warm room and redr All growing pains or joint tenderness must be watched sedulousl the child put to bed and given salicylates when they occur. children should never be too warmly clothed, except possibly as to underwear, and should never be allowed to have their knees, shou

or arms left bare or their feet carelessly wetted. If they are sturdy children and perspire a great deal, linen mesh underwear may be tried in place of flannels. Indeed, it is distinctly important for children susceptible to rheumatism to live in a dry climate, especially in winter. Adenoids and enlarged tonsils should be completely removed.

The diet is of importance and had better be nitrogenous, and not include too much of starch. Milk is the best food. General tonics are often needed for the repair of the blood dyscrasia, especially iron and cod-liver oil.

Gonorrheal articular rheumatism is rare in children, but when it does occur, it is mostly confined to one or a few joints. The effusion may be large and become purulent. The joint should be immobilized, and the patient treated with injections of the gonococcic bacterin. If pus forms, the case should be referred to a surgeon.

MUSCULAR RHEUMATISM

Muscular rheumatism occurs in children of from five to fifteen years of age. It often follows exposure to wet or drafts, and especially when to these is added fatigue. Indiscretions in diet followed by constipation may in older children be a not infrequent cause. The exciting causes are: constipation, improper clothing, especially shoes that are too thin, any underclothes or socks other than wool, warm and damp weather, imprudences in diet, depressing conditions generally, overfatigue, and loss of sleep. The parts of the body most usually attacked are the shoulders, neck, and back, and the pain is pronounced on movement. Bear in mind that there may also be rheumatism of the cervical vertebræ in torticollis. There is little constitutional disturbance or heart involvement. Muscular rheumatism is likely to be confounded with neuralgia, and may take the form of head pain. The urine is generally highly colored and loaded with urates. The best treatment is prevention, cold baths, and care of the skin generally, along with suitable clothes. In acute attacks Dover's powder acts most promptly, or atropin hypodermically, followed by saline diuretics. Aspirin acts more efficiently for internal medication than any other of the salicylates that we have used. We would place acetphenetidin and salol (phenol salicylate) as second in efficiency. Locally extreme dry or wet heat, iodin; methyl salicylate, galvanism, and rubefacients, are efficacious.[1]

[1] NOTE:—In torticollio we have obtained phenomenal results by injecting Schleich's acid into the muscle. (Sterno-cleido-mastoid). Strapping the chest with adhesive strips promptly relieves pleurodynia, and proper strapping of the pelvis relieves lumbago.

Another convenient agent is the kitchen flat-iron well heate and applied over a thin flannel garment, slowly moved about the a fected and adjoining areas. A hot-water bag is useful but far less effica cious. The most satisfactory preventive treatment of chronic muscula rheumatism is a strict regimen, consisting of proper woolen clothing, active exercise in the open air, such as bicycle riding, tennis, etc., until the patient is in a glow, or, better, a sweat, and before any chill can have taken place go at once to a dry room in which the temperature is not below 65° F. (18.3° C.), and with the extremities still protected, rub the chest, back, and limbs until the skin is dry.

Chronic Rheumatism

Chronic rheumatism is very rare in children, but may occur whe acute attacks recur a number of times. As the investigation of chron joint conditions progresses, however, it is perfectly apparent th "rheumatism" has been but a convenient term of the past under whi many totally different affections have been grouped. Some mode authorities hesitate to speak of chronic articular rheumatism at a We believe that the term should be applied only when the affecti follows several attacks of indubitable acute articular rheumatis Cases which resist rheumatic medication from the beginning a exhibit an early tendency toward chronicity, which display later c formities, muscular atrophy, shininess of the skin, etc., are probabl cases of *arthritis deformans* and not of rheumatism. Such cases are ra but have been described by a number of authorities.

Still's Disease is another example of an affection that should not called chronic rheumatism. In addition to joint enlargements, oft accompanied by tenderness and deformity, the subjects of this disea exhibit subfebrile temperature (often only during exacerbations), e larged lymph nodes and enlargement of the spleen. In one case, close answering the description of Still's Disease, Edsall recovered tuberc bacilli from an affected joint. He did not ascertain whether the organisms were alive or not.

It would appear too that certain cases of joint tuberculosis ma closely simulate a rheumatic affection.

The treatment of these chronic joint conditions, though of nece sity lengthy and tedious, is sometimes productive of very good result Physical measures, such as hydrotherapy, dry heat, massage, electrici (particularly high frequency currents), the X-ray, etc., have proved great value in this group of affections.

In arthritis deformans and where tubercular disease is suspecte

tonic treatment should be actively employed, Potassium iodid has proved of benefit for the relief of pain. In Still's Disease, thymus gland has yielded some remarkable cures. (Gibney, Abrams, and others.) Bad teeth, diseased tonsils and adenoids should be removed.

Rheumatic Phlebitis

Rheumatic phlebitis is rare in children. According to Schmitt and Virchow, the initial lesion is found in the endothelial lining of the veins, and the inflammation spreads gradually until it reaches the outer layers of their walls. Periphlebitis is rare in rheumatic cases. The ultimate cause of the phlebitis is probably due to the presence of emboli in the blood, but we are as yet unable to prove this theory. The most prominent symptoms of rheumatic phlebitis are a sudden rise of temperature, pain, and the presence of a thickened cord on palpation. The pain is due to acute irritation of the nerves supplying the lining of the vein. To feel the indurated vein, careful palpation is necessary sometimes, as the vein may be situated deeply. Edema is a later symptom, and its intensity is in proportion to the size of the infected vessel. If the edema persists for some time, there may be complications in the form of ecchymoses, vesicles, and even gangrene of the skin. The edema is due to the action of the toxins produced by the bacterium which is responsible for the thrombosis.

Rheumatic phlebitis may occur during an attack of articular inflammation, or during convalescence from such an attack. It is most frequently found in the lower extremities, and in such cases is almost always curable. In other cases it occurs in the upper extremity, and is almost always fatal. The occurrence of pulmonary emboli can be prevented by immobilizing the limb on a wooden trough well padded with cotton and placed on several pillows to favor return circulation. The pain may be relieved by means of anodyne liniments. Against the edema, which appears later, the best measure is compression of the limb by means of a bandage, which must be applied over a layer of cotton. The atrophy which follows in these cases may be treated by baths, which should be luke-warm at first, then hot, and followed by a short treatment with massage. Salt baths and a sojourn at one of the seaside resorts are of value in convalescence.

ERYSIPELAS IN INFANCY AND CHILDHOOD

Definition.—Erysipelas in an acute infectious disease due to the entrance into the subcutaneous tissue of the body of the streptococ-

cus erysipelatos of Fehleisen. In text-books upon pediatrics it is quite usual to deal only with erysipelas as it occurs in the new-born. This we believe to be a mistake of omission; for throughout infancy and much of the child-life the disease possesses special characteristics and significance.

Etiology.—The disease is caused by streptococci indistinguishable from the streptococcus pyogenes group. Koch was the first to discover it in the inflamed and edematous lesions of the disease, and Fehleisen was the first to cultivate it and produce the disease by inoculation (McFarland). It is probable that the organism always gains entrance to the subcutaneous tissues through an abraded skin surface. One is not surprised to learn, therefore, that it often attacks the umbilicus of the baby, or the genital region or the delicate tissues of the face. Age is certainly of importance, and in general, the younger the child, the more susceptible is he to this disease. Season is of importance, too; for as Anders has shown, most of the cases occur in the first five months of the year. Erysipelas is more common in institutions, particularly hospitals, than in private practice. Its tendency to cling to walls, bedding, etc., has been well known for years. In preantiseptic days, surgical erysipelas was a dread disease. In childhood, erysipelas may appear as sequel of the exanthemata, particularly varicella (Watson, etc.). As a vaccinal or post-vaccinal complication, it must also be reckoned with.

Pathology.—The morbid anatomic finds may be few—only swelling and edema of the skin and subcutaneous tissues being manifest. But even here the disease may be different from adult erysipelas, for the lesions may not be confined to the face, but general. Again, we find the navel wound and the genitalia favorite sites of invasion. Streptococci are found in the lymph spaces, many of them in leukocytes. It is in the areas beyond the lesions that Metschnikoff contends that phagocytosis proceeds. With umbilical lesions, umbilical phlebitis and arteritis are common. Infected emboli may be carried to the liver, causing multiple abscesses, or may lodge in the lungs, kidneys or spleen (McFarland). Peritonitis of a purulent nature is another complication of this form of omphalitis. Pleuritis and pericarditis may also occur, usually in conjunction, while endocarditis is rare. (Hirst has reported a case.) Pneumonia and meningitis should also be mentioned here. though both are less common than is usually taught. Anent of meningitis, Osler studied a case in which the process had proceeded intracranially along the course of the fifth cranial nerve. Abscesses and even gangrene are seen as complications more often than in adults.

The streptococcus may cause death in infancy and childhood, when evidence of clinical erysipelas is absent. Thus it may gain access to the pharynx or larynx, the lungs or the intestine. In the first two situations, it may cause membranous local lesions; in the lungs, pneumonia, and in the bowel, ileocolitis.

Symptomatology and Clinical Course.—Upon the symptoms and signs of the adult disease we shall not lay stress, but rather upon the clinical peculiarities of erysipelas as it occurs in early life:

When erysipelas attacks the navel in the first few days of life, the tissues surrounding it become greatly swollen and brawny, and the color of the skin is dusky red. Barring the rapid development of the mass at the navel, one might be led to think of malignancy. There is usually fever, though it may not be very high (102° F.). The infant succumbs rapidly, with evidences of peritoneal involvement.

Contrary to the usual teaching, we have seen pure facial erysipelas in infancy. A baby was seen by one of us with Dr. J. Cooke Hirst. She had been a premature baby (seven months) and was two months old when attacked by this disease. The mode of invasion was interesting, and should receive attention; for we have observed the same sequence of events in one other baby. Dr. Hirst's patient had a coryza, and after two days of this, developed a left otitis media. The discharge from the ear excoriated the auditory canal, and a typical facial erysipelas spread from this situation. She was quite ill; but the disease showed no tendency to invade the neck or trunk. Our other patient was a hydrocephalic baby, not quite two years old. Like the first, he exhibited coryza, otitis media and subsequent facial erysipelas.

We would not infer, however, that facial erysipelas is the type of the disease as it occurs in infancy. The reverse of this is true: If erysipelas starts on the face, as from a scratch, it tends rapidly to invade the rest of the body. Moreover, it is far more common for it to start elsewhere, as around the vulva. In several cases, we have noted a marked odor of decomposing smegma, and have elicited a history of a preexisting vaginal discharge. We are convinced that the irritation so produced accounts for the tissue of lessened resistance which permits of invasion by the streptococcus in this locality. Children affected with erysipelas migrans may have less constitutional disturbance at first than adults exhibit; but on the other hand, their resisting powers are obviously less. The disease not only spreads over considerable areas, but the same regions of the body may be invaded over and over again. Thus the infant eventually succumbs from complications or exhaustion. If the process starts in the region of the genitalia, it

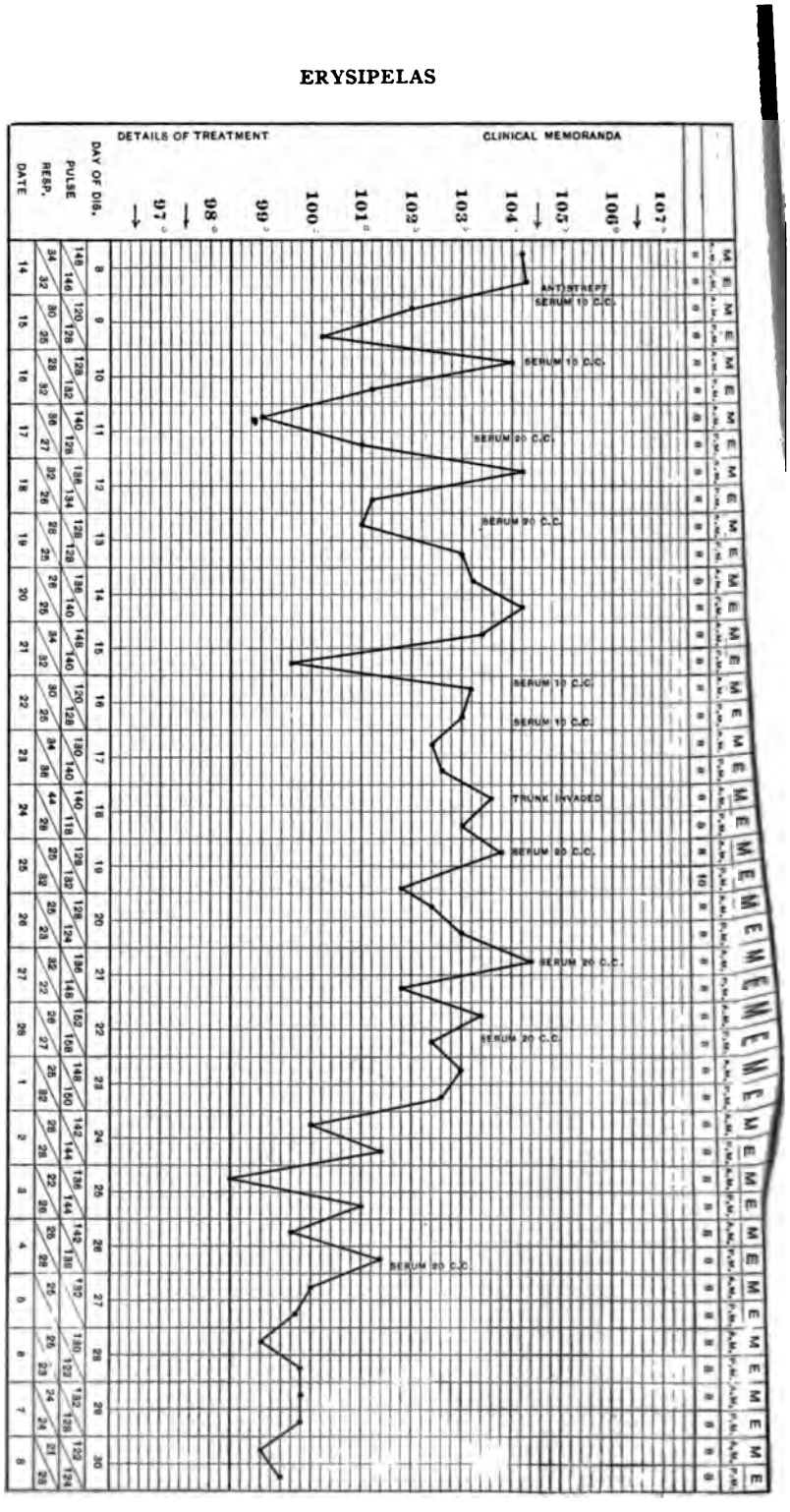


FIG. 107a.—Erysipelas ambularis in a 7-months old baby. The attack lasted 30 days, and was treated with antistreptococcic serum with recovery.

eds downward over the legs. It may not pass above the waist, ly it does. Abscesses and gangrene, as previously stated, on accompaniments of the erysipelatous lesions. Albuminu- rule, and nephritis may occur. Indeed any of the complica- tioned in the pathologic section may be noted in these cases. y seen by one of us in the practice of Dr. Minehart seemed overing under antistreptococcic serum, when she developed and signs of intussusception.

ccompanying chart well illustrates the severe course of ery- grans in infancy. See Fig. 107a. The patient was a sturdy of seven months when taken ill. She had had a vaginal dis- th the odor of smegma for some time prior to her illness. se started in the right labium, and rapidly spread down the h. The left lower extremity was next attacked. Both her terribly edematous. The subsequent lesions on the trunk were much less severe; we believe, because of the use of ococcic serum. Her face was spared. Her total illness ex- er thirty days. She received 180 c.c. of antistreptococcic

in later childhood, erysipelas may prove very severe. More facial erysipelas may be accompanied by lesions elsewhere. s, "acute necrosis of bone may sometimes be mistaken for "; but we have seen septic periostitis of the tibia and septic accompany facial erysipelas in a child. The patient was a ld girl seen in the practice of Dr. Horatio Jones. How severe erysipelas was may be gleaned from the statement that her nbled the great beak of a bird. She also had many abscesses ues of her eyelids. We drained a large amount of pus from ar tissue of her right leg, and weeks later she was operated periostitis. Her disease showed no tendency toward spon- abatement; but she started to improve when Marmorek's s employed.

veral cases of erysipelas, we have found the pulse pressure his was notably true in the case just recorded. Her systolic was 110 mm.; her diastolic, 60 mm.

nosis.—This should be made with little difficulty. The locali- asion, the typical color, the inflammatory border, the tendency , and the presence of fever, all go to make a clear-cut clinical

nosis.—In general the disease is more severe and more fatal ife. The younger the infant or child, the worse the prognosis. never seen recovery when erysipelas attacked the umbilical

wound of the new-born infant. Nor have we seen recovery, except in the case recorded, from erysipelas migrans in infancy. Our experience with Marmorek's serum is not sufficiently large to enable us to speak authoritatively; but we believe that it is capable of saving cases heretofore regarded as hopeless. Vaccines have proved of curative value in some recorded instances, notably in the case of a three-weeks-old baby reported by Borden.

Treatment.—In infancy prophylaxis offers much: Care of the umbilical stump, avoidance of abrasions of the skin surface, and avoidance of oral infection are the chief prophylactic measures. With Epstein, we condemn the senseless, even dangerous washing of the baby's mouth. The obstetric nurse, who looks after the lochial discharges, should not introduce her fingers into the baby's oral cavity. The genitalia should be kept clean, carbolized oil being a good preparation with which to remove smegma.

Common sense would suggest that we do not expose babies or children to patients suffering with erysipelas, and that we should not introduce them into apartments or wards where the disease has been treated.

Medical students and physicians should view vaccination against small-pox as one of our sacred heritages. So viewing it, they should see that its practice is aseptic, and that post-vaccinal infections with streptococci or other pathogenic organisms be prevented.

When taken with erysipelas, the stricken child should be treated in a large airy room, or even in the open air. On several occasions during her protracted illness, we sent the seven-months-old baby, whose case has been mentioned, into the open.

Locally, in erysipelas, nearly everyone employs ichthyol. Our personal preference is for the following ointment:

℞. Ichthyol..... 10–20 per cent.
Guiacol..... 10 per cent.
Plumbi iodidi..... gr. xxv.
Lanolini..... ʒj.
M.
Sig.—Apply locally on gauze or lint.

Rachford uses unguentum Credé, rubbing it into the healthy skin surfaces. We have never injected carbolic acid or other antiseptic solutions around the erysipelatous lesions.[1]

Stimulants are employed in most cases, good whisky or brandy

[1] Note:—Remarkable improvement sometimes follows the local use of saturated solutions of magnesium sulphate.

ıtimulants of choice. Colonic lavage and enteroclysis we all of these cases, usually twice daily. From a number of they seem indicated, and they appear to do good. We tincture of the chloride of iron in older children; but do n babies. Iron is needed eventually, however, in patients ıg enough to exhibit the inevitable anemia.

ccines, we have had no experience in this disease; though y they appeal to us more from the standpoint of prophylaxis f cure.

ıcy, we have employed from 10 c.c. to 20 c.c. of antistrep- rum as the individual dose, and have not repeated this than twice in 24 hours. Older children may receive 100 : in the course of a day. Rachford injects from 3 to 5 c.c. nd repeats the dose every six or eight hours. We advocate Marmorek's serum in all infants or children dangerously ıipelas.

PELLAGRA

on.—This is a disease of unknown origin; but is probably n nature. It is observed principally in rural districts, -alpine ones, of sub-tropical and temperate climates. The characterized by cutaneous lesions (erythema and dermat- ive and other alimentary disturbances and by nervous symptoms. It is also distinguished by its seasonal char-

y.—Since the earliest reports (Casal in 1735, Strombio, the disease has been attributed by Spanish and Italian maize or Indian corn. Someone has said that they forgot lagra in their interest in corn. Sambow (1905) and others , however, that the various explanations seeking to connect pellagra were untenable. Sambow comes to the conclusion ease is caused by an animal parasite, yet undiscovered, and conveyed by a biting fly of the Simulian group. For the ıs advanced in support of this theory, the reader is referred on tropical medicine and the ample monographic literature. ease is no respecter of age, one of Wood's cases (Tyson and ng only 22 months old. It is more often observed in mem- female sex. Negroes are less often affected than whites. se of the country rather than the town, and of the foothills of alpine or seashore localities. (Simulians rarely enter

towns, and they plant their ova in rapidly running streams.) Pellagra is not inherited.

The disease is common in Spain, Italy, Portugal, Egypt, southern Asia and southern Africa, etc. Since the attention called to this affection by the independent contributions of Searcy and Babcock (1907), it has been found to be relatively frequent in the United States. It has been reported from all our States but nine; though it is far more common in the Southern Atlantic States.

Uncinaria, dysentery and other conditions inducing depraved states of health probably bear important relationships to the incidence of pellagra.

Symptomatology.—This will be dealt with briefly:

1. *Cutaneous Phenomena.*—These appear in the spring, summer or autumn, and tend to disappear in the winter months. They are in the nature of an erythema or a dermatitis. Lesions also appear in a marvelously symmetric manner. Thus the dorsums of both hands will be affected; the lesions will involve the wrists (like cuffs) and will extend upon the flexor surfaces of the forearms. Another favorite situation is on the nape of the neck, above the collar line ("Casal's collar"). Lesions may also be observed in patches upon the face (cheeks, forehead, eyelids, etc.); but the "pellagrous-mask" is rare in this country. In a word, lesions tend to appear upon parts of the body unprotected by clothing and exposed to solar rays. They may involve other portions of the cutaneous surface; but unless one finds the symmetric involvement of exposed parts, the diagnosis of pellagra should not be made. In children, who run barefoot, this important tendency is further exemplified, for their feet and knees become similarly affected.

Cutaneous lesions may be dry or moist. Under the latter conditions, horrible blebs may form and become infected. Both lesions desquamate, and leave healthy-looking skin beneath. At first, the color and general appearance may resemble sunburn; but the course is essentially chronic and very different. The color varies in blonds and brunettes: but is usually dusky, and later becomes pigmented (chocolate, etc.). Just within (1/4 in.) the border of the lesion, is the line of hyperkeratosis which often remains after other skin manifestations are gone.

Gastro-intestinal Symptoms.—The principal ones are stomatitis, with dry thickened tongue, and moculo-ulcerative lesions, anorexia and dysphagia, dyspepsia, and weakening diarrhea, varying in degree and character (dysentery, etc.). By many authorities, it is doubted that any one of these symptoms is other than a complication (secondary

n, etc.) of the disease. Entamebic and bacillary dysentery may y be viewed in this way. Gastric acidity is lessened, but lactic increased, and mucus may be present in large amounts.

vous Symptomatology.—The pathology of the nervous system pigmentation, perivascular infiltration, and the tendency to isease, particularly of the pyramidal and posterior columns. ar atrophy has been observed; but failing to accord with the ly recognized types. One may note, clinically increased or knee-jerks, the Babinski phenomenon, painful neuritis accom- ; the eruption, melancholia or terminal dementias.

:ases with no complications the blood picture is that of a low- ınemia. The red cells and hemoglobin are diminished. The ıclear elements are increased and there is a slight leukocytosis. ıtelets are present in excessive numbers.

gnosis.—Most authorities are agreed that when the triad of ms (cutaneous, alimentary and nervous) is present, the diagnosis be made quite readily. It should not be made in the absence neous lesions; though the latter alone may serve to permit an e diagnosis. The affection should be differentiated with care ırue, leprosy, weeping-eczema and syphilis.

gnosis.—Wood thinks that the disease exhibits a mortality of o per cent. Some have placed it as high as 39 per cent. In all ses, the chronicity of the disease and its tendency to relapse in m seasons should be borne in mind.

atment.—The patients should be removed into districts where ease does not exist—mountains, seashore or towns. Every : of personal hygiene should be studied and regulated. During te stage, patients should be kept at rest, just as the tuberculous ood). The best diet is milk, and it may have to be pasteurized onized. The stomatitis should also receive appropriate atten- kaline and antiseptic mouth washes; care of the teeth, etc.). st drug therapy is with some of the modern preparations of

Salvarsan has apparently failed. Atoxyl is most valuable; ; proved dangerous. Wood prefers soamin, because it is less ıd may be secured in convenient tablets (1 to 5 grains). He a solution of the drug deep into the gluteal muscles, and re- ıe injection every four days. The adult dosage ranges from /2 grains (0.3 to 0.5 grams).

CHAPTER XVIII

DISEASES OF THE THYROID GLAND

With conditions that result from athyroidea, myxedema, cretinism, tc., we shall not deal in this place, but shall simply refer the reader o our consideration of cretinism.

EXOPHTHALMIC GOITER

Definition.—Exophthalmic goiter may be defined as a definite symptom-complex dependent upon hyperthyroidism, or excessive secretion of the thyroid gland.

Etiology.—This disease, known as Graves' thyroid disease by the English and as Basedow's disease by the Germans, is confined chiefly to adults, but begins occasionally in childhood. We have seen three cases. It occurs more than three times as often in the female sex than it does in males. It is necessary to distinguish between this and an enlargement of the thyroid gland, and also certain disturbances in the cardiac rhythm seen in girls at or near puberty. Again, there are other instances of tachycardia, usually transient, but occasionally most persistent and confusing, as in the case of a boy, a patient of one of us, who baffled the skill of many physicians, finally getting well of itself in spite of overmuch medication. The most frequent exciting cause is excessive emotional excitement, but this is usually superadded to some other exhausting disturbance. Rheumatism and typhoid fever have been quoted as causes, and statistics show a goodly number of rheumatics among exophthalmic goiter patients. In family histories, tuberculosis s often found, and one of our own patients developed phthisis florida when she was seventeen years old. Her father had died of tuberculous peritonitis.

Pathology.—The morbid anatomy of Graves' disease has been tudied by Greenfield. The changes in the thyroid gland are those videncing "an organ in active evolution, viz., increased proliferation, ith the production of newly formed tubular spaces and absorption of ie colloid material which is replaced by a mucinous fluid" (Osler). ccentric hypertrophy of the heart is found. Sometimes there is pulonary tuberculosis. Persistent thymus is another common find.

The symptoms of exophthalmic goiter are rather numerou
The three classical symptoms are: Irregular and excited action
the heart (tachycardia), enlargement of the thyroid gland, and protr
sion of the eyes. There are certain accessory symptoms, the mc
important of which are connected with a disturbance of vasomot
control. S. Solis Cohen has suggested the term "vasomotor ataxia
The skin is usually much relaxed, and there is almost constant sweatin
sometimes excessive, which may be localized or general. Tremor, tc
is a very usual phenomenon in this disease. There is often, too,
apparently causeless diarrhea, seemingly independent of intestir
disturbance, most difficult to control. The kidneys frequently suf
in the same way, as shown by albuminuria and occasional hematur
In some instances sugar appears in the urine also. There is occasio
ally disturbance of respiration, and attacks resembling asthma occ

The most important symptom is the disturbance of the action
the heart, which can scarcely be called organic at first, although wh
unduly prolonged, it invariably gives rise to dilatation and hypertrop
The sounds of the heart are not, as a rule, altered, but may be unusua
loud, and musical murmurs at the base have been described. T
pulse oftentimes runs very high, especially under excess of excitement
slight exertion. Hemorrhages, as from the nose, are not infreque
also into the alimentary tract. One of us has paid a good deal of atte
tion to this disease, especially in adults, and several cases have be
observed, especially in young girls, which seemed to be instances of t
disorder, but exceedingly mild. In some of these the tachycardia v
absent or only occasionally present, but the enlargement of the thyro
exophthalmos, the leaking of the skin, attacks of dyspnea and trem
especially a vibratile quality of the voice, were all observed. The
largement of the thyroid gland is usually present, but the other sym
toms may exist without it. It is likely to follow the development of
tachycardia. The bronchocele is generally of both sides, but one s
is usually bigger than the other. The exophthalmos is less constar
present than the tachycardia or goiter, and while, as a rule, of both ey
may be unilateral or more marked on one side than the other. T
cause of this is probably interference with the cervical sympath
nerves. It disappears almost immediately after death. Vis
is rarely interfered with. The pupils may be unequal, but of nor
reaction. Von Graefe's symptom (a failure of the upper lid
follow promptly the downward movement of the eye), is import
but is by no means constantly present. Stelwag's sign may occu
cases exhibiting Von Graefe's sign, or it may appear alone. There

ı addition to these phenomena, evidences of mental disturbance
ıf equilibrium, commonly present at some stage of the disease.
with Graves' disease are usually irritable and fretful,
is not to be wondered at when one reflects how annoying it is,
eling in other ways pretty well, to be constantly limited in
energies, to find one's self unable to sustain any ordinary
without prompt distress. Headache is a not uncommon

ıtment.—There is no reason to believe that we have found any
for this disease. A removal of some part of the enlarged
is a much more rational measure, as the work of Kocher, the
Ochsner and others, has amply demonstrated. Operation
ıe performed in all cases which fail to yield promptly to medicinal
ıs and rest. Attention should be directed first to the vascular
ı, by absolute rest in bed, at least for a few weeks, with gradu-
urn to activities; uniformity in diet, at first milk or its equivalent;
attention to digestion and elimination; and agents which will
ize and control cardiac action. In conjunction with rest,
ɔmmends the local application of an ice-bag. Small repeated
hyoscin hydrobromate have given us the best results as a tran-
and vascular control agent, along with phosphate of soda
ɡlycerophosphates, and from time to time the use of the direct
tonics, of which digitalis is the most satisfactory. Sometimes
nthus slows the heart more promptly than digitalis. For the
g, a distressing symptom, if hyoscin hydrobromate fails to con-
, picrotoxin acts admirably, from 1/100 to 1/50 of a grain, as often
ɔe needed to produce an effect. In the vasoconstrictor action and
ly where there is defective vasoresistance, the use of Merck's
ı is of great value, in ascending doses until results are secured.
nd frictions are important, especially salt, as sea-water. As a
pplication to the skin aromatic vinegar is pleasant and effective.
diarrhea, opiates and the aromatic sulphuric acid are useful.
ı serum has proved of service in some cases. The Röntgen
ve also produced a marked diminution in the size of the goiter.

istic of syphilis, are but areas of postmortem softening (Chiari). Indeed, even in the presence of extensive phlegmonous processes in the neck, the thymus gland seems to resist invasion. Sarcomata, lympho-sarcomata, teratomata and dermoid cysts have been reported as occurring in the thymus. Of course the gland may be involved in mediastinal growths emanating from other tissues.

THE "STATUS LYMPHATICUS"

Synonyms.—LYMPHATISM; LYMPHOID CONSTITUTION; THYMIC DEATH; THYMIC ASTHMA; THYMIC LARYNGEAL STRIDOR, ETC.

(Note: Some of these terms are not exactly synonymous; but it is convenient to consider all under this caption.)

Definition.—The "status lymphaticus" is a vice of constitution that is probably dependent upon hyperthymidization. Its subjects are usually pale and chloroanemic. They present in addition, hyperplasia of the thymus, enlargement of the superficial lymph nodes, of the lymphoid structures of the nasopharynx and tongue, of the tracheobronchial, and mesenteric glands, of the solitary glands, the Peyer's patches and the spleen. The circulatory apparatus, on the other hand, may be hypoplastic. Death may result from an intoxication, or from the disastrous mechanical pressure exerted by the enlarged thymus.

Etiology.—Just why the thymus gland hypertrophies is not known; but the balance of evidence would seem to show that the enlargement is not compensatory, in a lympho-toxemia, as Warthin and others have claimed. The excessive thymic secretion is probably provocative of the lymphatic and other changes. According to Holt, the condition is most likely to manifest itself between the sixth and twelfth months of life; but it may appear at any age. There is a more marked lymphoid hyperplasia than is seen in any other condition of childhood (Holt). The thymus may attain proportions that are relatively enormous (30–40 grms., or as in Koppe's case, 52.9 grms.). Congestion and edema may further contribute to the increase in size (Warthin). The thymus may occupy the greater portion of the thoracic cavity, as in a case recently reported by MacIntire. In his case the gland extended the length of the sternum, was adherent to both pleuræ and pericardium, and had displaced both the heart and lungs. Pressure marks may be noted upon adjoining structures, or the gland itself may exhibit evidences of pressure. (From tracheal rings, great vessels, etc.)

The structures composing the Waldeyer ring are also hyperplastic. The follicles on the dorsum of the tongue are likewise tumefied. The tracheo-bronchial glands are as "large as cherries," and the mesenteric glands may be larger. The Peyer's patches are prominent and the solitary follicles stand out prominently. The spleen is enlarged, and on section, the Malpighian bodies are very prominent. Paltauf (1889) and others have called attention to the hypoplastic state of the circulation. In addition, the heart muscle may show fatty changes.

E. Moro and others have stated that there is an intimate relationship between the status lymphaticus and scrofula. The former probably predisposes to tuberculous invasion of the lymph nodes. Bronchitis, pulmonary edema and other respiratory affections have been noted at autopsy.

Symptomatology and Clinical Course.—The infant may exhibit symptoms from the time of birth, as in a case reported by Carter. The symptoms in his case had been dyspnea, orthopnea, cyanosis and retraction above and below. When the baby was tracheotomized, at five weeks, a mass of glandular tissue presented in the wound, and it was observed that the trachea was pressed far back. On the other hand, the baby or child may present few symptoms, until he is suddenly carried off by a fatal attack of dyspnea, or a series of convulsions. Again, a slight respiratory infection may induce a fatal ending, as in one of Ullom's cases, and reveal the existence of a hitherto unsuspected condition. Lastly, psychic shocks, anesthesia (particularly with chloroform), the injection of antitoxin (Professor Langerhan's child), a cold bath as in one of Escherich's cases, or indeed, a thousand and one seemingly trivial causes may result fatally to the subject of this diathesis. It has been claimed that the sudden throwing back of the head may induce disastrous pressure upon vital structures in the neighborhood of the enlarged thymus.

The symptoms may be few indeed: Dyspnea, accompanied by stridor, cyanosis, cough and vomiting; thymic asthma, induced by slight causes, such as indigestion, influenza, etc.; convulsions, and sudden death from some slight cause, are cardinal symptoms of this affection. Eczema, prurigo (Escherich) and laryngismus (Kassowitz) are other less common accompaniments. In addition to these, the child often presents evidences of rickets.

The objective finds are more positive and more numerous. The child, though possessed of a fair amount of adipose tissue, is pale and pasty of color. Adenoids and hyperplastic tonsils are in evidence. His superficial lymph nodes are all palpably enlarged. His area of

thymic percussion dulness is increased, and his spleen is demonstrably enlarged. An examination of his blood reveals a chloroanemia and lymphocytosis (Rachford). Cutaneous and percutaneous tuberculin reactions prove negative, unless he has become scrofulous. We agree with Rachford that this diathesis should be borne in mind when we examine youthful candidates for anesthesia and operative procedures.

Blumenreich describes the normal area of thymic dulness as a somewhat irregular triangle, with its apex pointing downward, and extending to the level of the second costal cartilages. Its upper borders extend to the manubrial margins, a little beyond on the left side. The most delicate percussion ("finger-nail" percussion) should be employed in this determination. Basch and Rohn have devised a special instrument for this percussion, and combine auscultation with a half shut stethoscope with the light percussion (auscultatory percussion). They find a rhomboidal area of thymic dulness, more extensive than that described by Blumenreich. But in any case of doubt the service of the expert Roentgenologist should be sought. "The normal thymic shadow rests on the heart shadow like the narrow neck of a bottle is fixed on the body of the bottle" (Hochsinger). The enlarged thymus can be detected quite readily by the expert.

The disease is a serious one. The patient faces death and disaster in many forms. And now we must deal with the much discussed question of the cause of death. Whether or not the enlarged thymus may cause the patient's demise by mechanical pressure, and if so, how, are questions that have been discussed ad nauseam. Many of the arguments advanced pro and con remind us of the old-time dialectics. We shall avoid lengthy discussion, and shall ally ourselves with Svehla and others in the view that there is no doubt of the danger of mechanical pressure but that this acknowledgment does not invalidate the importance of hyperthymidization in other cases (Rachford). In Siegel's patient, a child of two and one-half years, a piece of gland as large as a hazel-nut appeared in the neck wound. This was drawn up, and relief was secured. Koenig's case is another in point, recovering from operation. Rohn opened the mediastinum, drew the gland forward and stitched it to the tissue behind the sternum, again with relief of symptoms. Chevalier Jackson's patient was immediately relieved of dyspnea when the hypertrophied gland was drawn upward in the wound. When the operator released his hold, respiratory difficulty recurred. More than this, tracheoscopy revealed a distorted trachea. This is all positive evidence worth reams of mere academic discussion. Warthin is probably correct when he maintains that such mechanical pressure is

st dangerous in infancy. Jacoby has shown that the distance from manubrium to the vertebræ in a baby eight months old is but 4/5 of inch (2.2 c.c.). In his masterful monographs, the positive side of e mechanical argument is ably championed.

On the other hand, we agree with the contention that most of the eaths, particularly in childhood, occur from the toxic factor (probably cessive thymus secretion). These represent the sudden deaths that ay occur at any period of the child-life. The studies of Paltauf and thers have placed the "status lymphaticus" upon firm pathologic and linical bases.

Diagnosis.—The salient features of the disease have been elaborated in sufficient detail. It may be differentiated from scrofula by the absence of caseation in the glands, fever and the modern tuberculin diagnostic reactions. Leukemia presents its own typical blood picture. Congenital stridor, from some anomaly of the larynx, will not reveal evidences of thymic hypertrophy, nor is it accompanied by an adenopathy. In eliminating laryngeal diphtheria from the diagnostic field, one may occasionally encounter great difficulties. The child may perish with laryngeal symptoms ere the aid of the laboratory can be secured. The difficulty will be greatly minimized, if one will but bear in mind the possibility of the status lymphaticus. Its objective evidences will be absent in diphtheria. Again, the dyspnea and stridor of membranous laryngitis are usually slow and insidious in onset. From the medicolegal standpoint, it may be necessary to distinguish between infanticide or accidental overlying and thymic death. Thus Grawitz reports two cases of the latter character, in both of which the nurse was suspected of infanticide. A baby, three days old, seen by one of us at the Philadelphia General Hospital, had probably been strangled, as there were finger-shaped bruises upon his neck. He was an illegitimate baby, the child of an ignorant Austrian woman. He presented cyanosis, inspiratory stridor and pulmonary edema. A one-year intubation tube was introduced into his larynx without difficulty. His symptoms were temporarily relieved, but he died the following day. The autopsy did not reveal any hypertrophy of the thymus.

Prognosis.—It is a relief to turn from the helpless view of a few years ago to the optimistic chapter in Rachford's book. Untreated, the infant with a hypertrophied thymus, or the older child with the fully developed "status" is exposed to countless dangers; but X-ray therapy and surgery offer him avenues of escape and a fair chance of recovery.

Treatment.—It was Heinicke who first demonstrated the selective

CHAPTER XX

DISEASES OF THE SKIN

APHTHOUS VULVITIS OF CHILDREN

Aphthous vulvitis is a disorder peculiar to children, and which may occur in the course of such systemic affections as roseola; it has appeared as an epidemic. It begins with the appearance of twelve or fifteen small vesicles, whitish or yellowish gray, confined to the neighborhood of the vulva. These may coalesce in a day or two into patches, and break down into shallow ulcers; the surrounding tissues are inflamed and swollen, accompanied by itching. If promptly treated, it soon gets well.

Aphthous vulvitis may occur simultaneously with aphthous stomatitis in the same individual, and may be confounded with variola, varicella, or localized diphtheria, and it especially resembles herpes of the vulva.

The treatment consists of aspesis and the local use of some antiseptic or astringent powder, as iodoform, aristol, boric acid, or acetanilid, added to a dusting-powder, as talc or starch.

DERMATITIS

Dermatitis, or inflammation of the skin, may be due to the action of local influences, such as heat, cold, caustics, and other mechanical and chemic irritants which directly exert their effect on the skin, and those which act indirectly, arising from within or taken internally, many are due to the ingestion of certain drugs and also to toxins.

Dermatitis Traumatica.—Under this head are included all those forms of inflammation of the skin due to traumatism, viz.: contusions, abrasions, or excoriations arising from direct violence to the skin—as, for example, especially in children, ill-fitting garments, shoes, bandages, and other articles of wearing apparel. Excoriations from scratching, due to the presence of the various animal parasites, are important varieties. Other accidental lesions are so well known as not to need detailed description.

Treatment.—Remove the cause, and, if necessary, apply soothing lotions or ointments. (See Acute Eczema.)

Dermatitis Calorica.—Extremes of heat and cold both produce analogous inflammatory symptoms, the former as burns and the latter as frost-bites. Erythema solare, or sunburn, is a well-known example of what natural heat can produce. Although this may be erythematous, vesicular, or bullous, it never goes on to complete tissue destruction, as may happen from the ordinary burns or scalds. Cold or frost-bite may produce death of the affected parts from prolonged interference with peripheral circulation.

Treatment.—In burns of a mild degree a saturated solution of boric acid or calamin lotion (for formula see Erythema) should be applied frequently on lint and the parts be kept well moistened or boric acid one dram and petrolatum one ounce may be used.

Treatment of Frost-bite.—If seen immediately after exposure bring parts gradually back to normal temperature by gentle friction by rubbing with snow or cold water. We have seen two cases in which children were told to plunge their feet while excessively cold in warm water result in an angioneurotic edema.

After the parts are restored to their normal temperature, stimulation is called for—applying a 12.5 to 25 per cent. ichthyol ointment in petrolatum or strongly carbolized ointments. Use warm woolen stockings, avoid the girdle garter, and also avoid approaching a fire too soon, which causes tingling and burning sensations. Local applications of menthol ointments (gr. x to gr. xx to the oz.) often give decided relief to chilblains.

Dermatitis Venenata.—This heading includes all inflammations caused by numerous external irritants which act deleteriously on the skin. The commonest causes are the well-known irritants—mustard, turpentine, cantharides, mezereon, arnica—anilin and corallin dyes (from undergarments and stockings), mercurial ointments, poisonous insects and fish—Portuguese men-of-war, etc. But the most common causes are the rhus plants—poison-ivy (or poison oak) and poison sumac (or poison dog-wood). The susceptibility to this poison in individuals varies to a great extent; some can handle the plants with impunity, while in other cases mere proximity is sufficient to cause cutaneous disturbance (toxicodendric acid, Maisch). The lesions produced on the skin are erythema, wheals, papules, vesicles, pustules, or bullæ, with or without edema and swelling. The effect produced depends on the susceptibility of the individual, the virulence of the poison, and the length of exposure, or a combination of any or all. The symptoms of poisoning by rhus toxicodendron (poison-ivy or oak or poison sumac or dogwood) appear soon after exposure. As a rule, the poison acts

quickly, a few hours often being sufficient to provoke an attack; in other cases several days are required. The vesicles vary in size from that of a pinpoint to that of a split pea, and are seated on inflamed and usually inflammatory bases. These vesicles are frequently angular (eczema vesicles are always round), and at times are arranged in streaks or lines. They may coalesce into blebs and become seropurulent or pustular. Marked itching and burning are, as a rule, present. The hands, face, and forearms (in the male the genitalia also) are the favorite parts involved. The disease runs an acute course; the vesicles burst spontaneously or are broken, the contents drying into yellow crusts. The process may continue for from one to six weeks and terminate in complete recovery; or, in those inclined to eczema, it may, however, result in a persistent form of that disease.

Treatment.—Remove the cause and apply soothing lotions and ointments, as in acute eczema. For rhus toxicodendron poisoning Ehring recommends the extract of grindelia robusta, one fluidram to four to six fluidounces in water. We have used a saturated solution of boric acid with good effect; also calamin lotion and black wash, followed by oxid of zinc ointment. But the best treatment consists in the use of alkaline lotions (Saturated solution of sodium bicarbonate, etc.)

Dermatitis Medicamentosa.—As a rule, the ingestion of drugs, especially in children, does not produce an eruption, yet the number of drugs which may produce disturbances of the skin is considerable and may cause difficulties in diagnosis. It is usually due to an idiosyncrasy, to some defect in the elimination, or to a poisonous dose, or, perhaps, a combination of these conditions. Acetanilid produces a livish tint of fingers and lips—a cyanosis.

Antipyrin (phenazone) causes an erythematous rash, morbilliform in character, and desquamation may follow. The eruption becomes confluent in patches. An important practical point here is, in a febrile case of a child, cause not known, not to give antipyrin as a febrifuge, as the drug may bring out an erythematous rash and mask the true nature of the disease. The rash of arsenic is erythematous or urticarial, or herpes zoster may be produced at times (J. Hutchinson). Atropin (belladonna) produces a diffuse erythematous blush, scarlatiniform, especially in children. The differential diagnosis is fortunately readily established by the dryness of the throat, dilated pupils, and the absence of fever and of desquamation.

Bromids.—The great majority of eruptions met with in connection with this group of drugs are pustular. They are usually acneiform, and

occur in the favorite sites of acne, viz.—the face, chest, back, and scalp. Sometimes they are furunculoid or bullous. In infants the eruption is liable to become confluent (Crocker). The lesions often continue to come out even after the use of the drug has been suspended.

Treatment.—Discontinue the drug and give arsenic internally. In cases of epilepsy, when bromids are necessary, the addition of arsenic will often prevent the acneiform cutaneous lesions.

CHLORAL HYDRATE.—Skin-lesions resulting from chloral are mostly erythematous, dusky red papules or a general scarlatiniform rash, followed by desquamation. "The oral and pharyngeal mucous membrane is also red, increasing the liability of its being mistaken for scarlatina, as a rise of two or three degrees of temperature is not uncommon" (Crocker).

IODID eruptions are mostly pustular, acneiform, appearing on the neck, shoulders, arms, and chest. They are also bullous at times, and may be erythematous, papular, hemorrhagic, or purpuric. Coryza may accompany the skin lesions.

OPIUM eruptions are erythematous, scarlatiniform, often accompanied by pruritus, especially of the nose, but this may be general.

QUININ eruptions are usually erythematous and may be urticarial.

TURPENTINE eruptions are erythematous.

ECTHYMA

Ecthyma is an inoculable and an autoinoculable disease of the skin, characterized by the formation of one or more rounded pustules resting upon an inflamed base and having a tendency to spread eccentrically, with the formation of a brownish crust. It closely resembles pustular eczema, but in this country is differentiated from it clinically. It begins as a red point, on the second day appearing as a small papule or pustule in the center of an inflamed area; on the third day it becomes acuminated in the center; it then increases in size to the fifth or eighth day, when it becomes a large, flattened pustule; by the ninth or eleventh day the central crust is formed, surrounded by a whitish circle, formed by the elevation of the epidermis by pus; thence it begins to heal, and by the fifteenth or twentieth day the lesion begins to disappear, leaving a more or less reddish-brown pigmented stain. Superficial cicatrices may result if the destructive ulceration has been deep enough. Ecthyma usually attacks the lower limbs, although appearing elsewhere. There are slight itching and burning. Furuncle differs from ecthyma by its more vivid red color and deeper in—

filtration. It may be transferred from one part to another by scratching, whereupon new lesions arise by inoculation, and it usually appears in debilitated people.

The **treatment** is systemic and tonic—extra diet, pepsin, cod-liver oil, and iron in the form of Basham's mixture. Locally, antiseptics and parasiticides are necessary. The crust should be removed by a starch poultice containing boric acid, and the lesions washed with sublimate solution and dressed with an ointment of boric acid 1 dram, calomel 15 grains to the ounce of oxid of zinc ointment.

ECZEMA

Eczema is the most common disease of the skin in this country, constituting from one-fourth to one-third of all cases. It is of almost infinite variety and distribution, and closely simulates a large number of other skin disorders. It is usually disfiguring and painful through the intensity of the itching and burning which accompany its progress. Eczema is an inflammatory, acute, or chronic disease of the skin, characterized at its commencement by erythema, papules, vesicles, or pustules, or a combination of these lesions, accompanied by more or less infiltration and itching, ending either in discharge, with a formation of crusts, or in desquamation. It is also described as a catarrh of the skin, affecting it as inflammations do the mucous layers. As encountered in children it has much the same features as in adults, but occupies certain situations more frequently in a child, as the scalp and face. It is also of a more acute, inflammatory type, and there is greater evidence of glandular enlargement, abscesses, and boils, especially in ill-nourished children or those of depraved vitality. The enlarged glands rarely suppurate. In former times all these were regarded as forms of sympathetic adenitis; it is, however, not an evidence of constitutional disease, but merely a sufficient irritation for which pediculosis capitis is an ample cause. Eczema in children may be acute, arising *de novo* from various causes, both general and local, and is then quite manageable. It is much more commonly met with as a subacute disorder following in the wake of a host of causes, the diverse forms of dermatitis and various specific diseases of the skin and the exanthemata. Eczema may occur as a localized patch upon the cheeks or scalp or under the chin, or generalized, scattered over the body and limbs in infiltrated patches of various sizes, appearing scaly, in aggregations of papules, or in weeping and raw surfaces.

It may, at times, be inveterately chronic, defying the wisdom of the

elect, and obdurately resisting every effort at relief, until the patience of the medical adviser is exhausted along with his wisdom, and to shield himself he may claim that to cure it at this stage would be "to drive it in and imperil life." Again, a critical epoch, such as the eruption of certain teeth, the period of puberty, a change in climate or in the weather, the rotation of the seasons, or, what is often very efficacious, a complete alteration in the environment and feeding, brings relief.

The form of the eruption may be the one typical of erythema, or papule, vesicle, or pustule, all of which may not be present at the same time, one form merging into another; but usually one will predominate. Any one of these may develop into eczema rubrum, which exhibits a red, raw, weeping surface due to the exposure of the rete mucosa, a shedding of the upper epithelial layers. Squamous or scaly eczema may also follow upon any of these primary forms, appearing in patches of red, scaly, and thickened skin. Finally, by reason of the duration of the disorder or its position upon tougher or tenderer parts of the skin, there may arise a bark-like hardness or horny, cracked, or fissured conditions. The most important symptom by far is the itching; this is the real disease, and passes the descriptive capacity of most sufferers, and likewise overwhelms their endurance. Eczema bears a close similitude to catarrhs of the mucous membrane, both in its habit of discharge and tendency to relapse. To be sure it often happens that the exudate is scanty, and eczema may remain a dry disease throughout its course, but it is capable of being made at any moment a wet one by sufficient irritation and scratching.

Etiology.—Eczema is by far the most common skin disease in childhood. It is a catarrhal inflammation of the skin to which the delicate tissues of childhood are especially liable, and from exciting causes the most numerous. There is a predisposition in some children to skin troubles, or rather to a vulnerability of the skin, probably because it is not well developed or because the individual has feeble resistance. In badly nourished children of lowered vitality from defective hygiene and constitutional inheritance eczema is most likely to arise, especially the pustular form, and it is frequently accompanied by swollen glands, ciliary blepharitis, and mucopurulent conditions of the ears. Scrofula on the one hand, and gouty parentage on the other are underlying causes. Vaccination is a common cause or, rather, an irritative starting-point in a susceptible child; so is measles, in which it often attacks the edges of the eyelids. The dietetic errors competent to initiate eczema are of large variety; too much food, especially of a coarse or improper kind, is quite as bad as too little.

od overrich in proteids seems to be hurtful, and certainly helps roduce one of the causes, lessened alkalinity of the blood; such foods as readily induce gastric acidity, such as undercked oatmeal, with sugar and cream, are recognized as direct ses. Czerny has described an "exudative diathesis." He thinks t the children affected by eczema are often children of neurotic ents. He also believes in taking away milk from an affected by, and replacing it with some carbohydrate food. Finklestein nks that the salts of whey may induce infantile eczemas. Dentin is blamed unduly for inducing eczema, but it is merely one form reflex irritation. There are many exciting causes: cold and damp ather, depressing heat, bad soaps, hard bathing water, and rough derclothing. There is a large variety of organisms capable of procing eczema, especially when the secretions have undergone composition.

In conclusion, it must be said that eczema requires for its proction, some underlying condition (tendency) and some form of ect or reflex irritation. Infancy in itself may furnish the idency—babyhood is an eczematous age.

Treatment.—To be accomplished in the treatment one must possess tience and resource. So rarely does the average practitioner attain s distinction that it is well worth choosing as a special subject of dy. This cannot be acquired, or only through infinite labor and in, unless the student has an opportunity, of which he shall avail nself adequately, to work in a skin dispensary for a considerable ie under the tutelage of a master of the art; such has been the thors' privilege, and so large and difficult is the subject, and so ny failures have followed our efforts, that the wonder is how any e could get along without a similar experience. We have had very od success in treating eczema in babies and children upon this neral outline: First, to regulate the diet, which in most instances quires thorough revision; next, to use some laxative and alkaline dicine which shall relieve both the bowel of offending matters and edite the flow of urine and lessen its hyperacidity; then comes the orcement of rather more rest and sleep than the child has been ustomed to get; the relief from excitement of all kinds as much as sible. The room in which the baby is kept should be of a southern osure, defending it against heat in summer, as much as possible, l cold in winter, and dampness at all times. A common room living room wherein cooking and washing takes place, often simulteously, alternating with clouds of steam and burnt-up air from

red-hot stoves and ranges, is most pernicious to tender skins and mucous membranes, producing catarrh of the respiratory passages, eyes, and mouth, and also producing catarrhal conditions of the skin, of which eczema is the chief. Such a room is also in a perpetual cycle of overheat or overcold. In children of the well-to-do classes this danger is, of course, escaped, and among them eczema is not so prevalent. They also escape another danger of the more ambitious of the poorer folk, who are overzealous in their use of soap and water. The final important hygienic consideration, then, is care in the pursuit of personal cleanliness, in which, among babies, not so much soap should be employed and a better article selected. It is not a question of cheapness, for good Castile soap costs no more than the ever-handy laundry soap, which is found so efficacious upon pots and pans and is made to do efficient duty on the very dirty child. Again, whatever soap is used, be it good or bad, it should be completely washed away after having been applied, which in infants and children should always be sparingly. A good practical rule is to insist in the final use, during the process of ablution, of another cloth and cooler water, which will make sure of a final riddance of all soap. Moreover, the water used warrants care, and it is well that it should be boiled before using.

So much for prevention as well as cure. When an eczema is present, or a dermatitis from which it may come, the first rule is to insist that no soap whatever shall be used, and only lukewarm boiled water (better still, saturated solution of boric acid) sparingly for cleansing purposes. To this may be added, with great advantage, a solution of bran, made by taking a handful of bran, wrapped up in a loose meshed cloth, dipped in hot or boiling water, and then stirred about and finally squeezed into the bath water. To this it is sometimes well to add a teaspoonful of bicarbonate of soda or of washing ammonia to a basinful, and, if there is much itching, from fifteen to twenty drops of carbolic acid or essence of mint, one or all. The carbolic acid has a certain danger unless cautiously used and in limited areas. Lastly, as a protective as well as a cleanser, sweet oil; by this is meant olive oil, when procurable, not cotton-seed oil, to each ounce of which add one to five grains of carbolic acid.

For large areas in babies a boric acid ointment—boric acid one dram, petrolatum one ounce—is safer and better. This, applied after a water-bath, defends the skin from irritation of clothing or moisture or whatever cause, and if the eczema is quite annoying, used upon a soft doppel of cotton will serve admirably in lieu of the

ater-bath. Under this treatment most eczemas of infants will get ell. In addition to this may be used powders, antiseptic and soothing -powders should always be both—or sometimes an ointment is eeded, first soothing and later stimulating. It will be noticed—and bservant mothers will volunteer this information—that eczema of ıe exposed parts, as the face or head, is obviously worse in damp, ormy weather or when melting snow is about, and grows conspicu- usly better as soon as a dry air prevails. Children with susceptible tins will need to be protected by veils when abroad, and, indeed, ıould not be allowed to go out in very bad weather. The ideal ondition for an eczematous child is a large room opening to the south, ith abundant window light, heated in such a way as not unduly to arch the air, and in which a number of healthy, growing plants are laced. The plants aid materially in regulating the atmospheric ıoisture in the most beneficent way. Such a room needs very little rtificial heat, especially in sunny weather; the children can be dressed s if for out-of-doors. Indeed, it is always better for children able) play about alone to have a thoroughly ventilated room, like the one escribed, and to use extra clothing rather than artificial heat for armth. The disease in young infants is usually acute; first, erythem- tous eczema, then papular, rapidly running into vesicular, then, as ffected by scratching and rubbing, there results the pustular or the d weeping eczema; accompanying is a certain degree of infiltration, ıd along with this a severe and painful itching, and the disease is ttended by the aggravation induced by scratching and rubbing. It a matter of amazement what an enormous strain from this infants ın endure for weeks and months. In adults it would induce a pros- ation of the nervous forces most disastrous. But, as has been said Dr. White, of Boston, it not seldom happens that a whole house- ld is exhausted in its endeavors to relieve the sufferings of an infant, ıo not only retains its vigor and plumpness, but in the end is the ly healthy member of the family. An ancient fallacy prevails still remote places, and be it asserted with caution, too, in high places our midst, that it is in some sense perilous to apply local remedies, ich may endanger the patient's life by driving the disease inward. is is a rag of the ancient humoristic theory, used as a skeptic cloak cover ignorance.

Van Harlingen lays down "two general principles which obtain in ard to the local treatment of eczema; these are, first, that in the acute m the treatment can scarcely be too soothing; second, that in the onic form the treatment can hardly be too stimulating. So long as

there are eczema and hyperemia there will be itching; so long as ther itching there will be scratching; so long as there is scratching there be no chance for the excoriated skin to heal." The infant or you child cannot be wrapped up in a cloth, swaddled in fact, in lotions ointments, but these must be applied in such a way as to permit freedo of movement; therefore one of the most valuable devices is the clo fitting garment devised by Dr. White, made of linen or lint, on whi these may be applied, and forms a protective coating to the inflam skin. This consists of a mask, fitting the head and face, with apertu for the eyes, nose, and mouth, and slits for the ears. It is, perhaps, b adjusted by safety-pins, and worn for twenty-four hours, or changed shorter or longer intervals. It is wise, also, where the trunk and lin are affected, to use a sort of strait-jacket in addition to the mask, an is well that it should cover the hands and feet also; the covering of hands defends the skin from scratching. This will immensely shor the course of the disease. Local remedies must be selected with st attention to the character of the lesions in each individual case. Ac eruptions should usually be treated with soothing remedies. If cr form, they had best be removed by boric acid ointment (one dram to ounce) before decomposition with its consequent irritation sets If itching is severe and aggravated by the rapid formation of vesic these should be allowed vent; when there is extensive infiltration al with itching, stimulating measures are required. To soften down crusts a starch poultice is of value, to which should be added 10 p of boric acid to 1000. This gives great relief, and should be chan from every three to six hours. In less severe cases muslin dippe bran or starch water and covered with waxed paper will do very w

Acute Eczema

In the choice of a remedy to relieve acute eczema it is bette begin by making the application over a limited area until its effec learned. In this way several remedies can be used if the affected a are extensive, and that which produces the best effect can then chosen. Cautious experimentation is essential to success. A pow mostly of starch, is best suited for large surfaces, to which may be ad lycopodium, bismuth, talc, dermatol, or other suitable powder in perimental patches. Moist applications are oftentimes soothing represent a continued bath. The starch poultice is one of the m reliable of the moist applications, adding 5 to 10 parts of boric aci 1000, as previously described. Potato starch is preferred. It r

be made by placing the starch in a flat bag, dipping in boiling water, and cooling; or ordinary washing starch rubbed into a smooth paste with cold water and spread upon linen and fastened with bandages may be used. This remedy gives great relief if used carefully and changed from every three to six hours. For the ordinary run of cases a decoction of bran or starch water applied on soft muslin and covered with thin impermeable cloths will suffice. If the same cloths are reapplied, they must be disinfected each time and creases and folds avoided. If the patient becomes chilly from these wet dressings, a layer of cotton-wool or flannel may be placed over them. A good routine plan for acute eczema is to begin by bathing the part with diluted black wash, or the following modification of it:

℞. Hydrarg. chlor. mite..... ℥ss
Mucilago tragacanthæ..... ℥j
Liq. calcis.....fl. ℥xj.
Apply on cloths laid on the skin for a few minutes.

Then, with the finger, gently rub into the surface, before it becomes dry, the following ointment:

℞. Ung. zinci oxidi,
Ung. aquæ rosæ,
Petrolat.....āā ℥iv.

Or Lassar's paste:

℞. Acid. salicyl.....gr. x
Zinci oxidi
Pulv. amyli.....āā ℥ij
Petrolat..... ℥ss.
Apply three times daily after first cleansing the surface with cosmolin.

Other washes recommended are these:

℞. Liq. plumbi subacetat. dil.....Oss
Glycerin..... ℥ss.

Also:

℞. Ext. grindeliæ robustæ.....fl. ℥ss-j
Aquæ dest..... Oj.

These last may be applied on cloths and remain until dry.

For the relief of itching, cloths wrung out of hot water, laid on in succession, are of use. Carbolic acid, the most efficient antipruritic, must be used with extreme caution in the acute stages. It may be added to the black wash along with a little glycerin, and is always useful, but only free from some danger of absorption and poisoning if the skin is unbroken. Ointments in certain cases suit better than

lotions. Cold cream is a better base for ointments for children than lard or vaselin. Oleate of zinc is a useful addition to some ointments:

℞. Zinci oleat.,
Ung. aquæ rosæ,
Ol. amygdalæ.....āā ℥ss.

The oleate of bismuth and the saturated solution of boric acid are also recommended; or:

℞. Resorcin..... gr. x
Glycerin..... ♏x
Bismuthi subnit..... ℥ss
Liq. calcis.....fl.℥ j.

For oozing and itching areas:

℞. Bismuth. oxid..... ℥j
Acid. oleic..... ℥j
Cera alba..... ℥iij
Vaselin..... ℥ix
Ol. rosæ..... ♏ij.

Rub the oxid of bismuth with the oleic acid, and let it stand for two hours, then place in a water-bath until the bismuth oxid is dissolved. Add the vaselin and wax, and stir until cold. Among other soothing dressings may be mentioned cucumber ointment, glycerol of starch, a pure almond and olive oil, and diluted glycerin, one part to four or six of boiled or distilled water.

Chronic Eczema

"Acute" and "chronic," used in describing states of eczema, are misleading; we may have an "acute" attack on top of an old chronic case induced by digestive or other disturbances. This must then be treated as an acute eczema by soothing measures only until this feature of the condition is under full control.

In most cases of subacute or protracted eczema the soothing treatment used in the acute form is alone suitable. It will occasionally be necessary, however, to make use of more stimulating remedies. Carbolic acid or resorcin are then the most valuable remedies. Preparations of tar are to be used with caution, as they may disagree and cause more inflammation, and are more suited to the inveterate chronic condition where there are desquamation and more or less infiltration. The portion of tar should rarely be more than from ten to forty grains to the ounce. The form may be the pix liquida or the oleum cadinum, the effects of which are practically identical.

For eczema of the scalp:

℞. Hydrarg. ammoniat.....gr. xx
Petrolat.....ʒj.

The red oxid of mercury, from two to thirty grains to the ounce, is useful. A mild mercurial ointment is the ammoniated mercury, from ten to twenty grains to the ounce, given above, and is suitable for the pustular eczema of children.

Preparations of tar must be thoroughly rubbed into the skin by a mop or the fingers of an attendant. Soap plays an important part in the treatment of some forms of eczema. Ordinary washing-soaps had best be used as little as possible. Strong alkaline soaps are used to stimulate stubborn patches or to remove infiltrations. A useful preparation for cleansing areas when covered with accumulated crusts and scales is:

℞. Sapo viridis..... ʒij
Alcohol..... ʒj-ij.
Dissolve with heat and filter.

This is a powerful stimulant and cleanser, rubbed in with a mop, taking great care to wash it all thoroughly out again with hot water; the surface is then dried with soft cloths, and a soothing ointment applied.

Other remedies for chronic eczema are mercurial preparations, useful only in limited areas and always with extreme caution:

℞. Hydrarg. chlorid. mit.....gr. v-xx
Ung. zinci oxid
Petrolat.....aā ʒss.

Sulphur and resorcin are valuable in some forms, particularly in eczema seborrhœicum, in ointments of from ten to twenty grains to the ounce of cold cream. Lassar's paste is useful here as well as in the acute forms. (See formula, p. 937.)

The treatment of eczema must include internal medication of such a kind as shall correct obvious disturbances. These are mostly digestive, and the remedies are outlined elsewhere. It is usually important to make occasional use of laxatives as well, sometimes in quite a long course, especially in older children. Diathetic conditions, such as gout or scrofula, are frequently a factor, or vasomotor disturbances of central origin, requiring both internal and external measures for their relief. Nutritional tonics are then needed, even though the subject exhibit no obvious deficiency.

The Use of Arsenic in the Treatment of Eczema.—As a rule, this drug given internally causes more harm than good. It acts as a direct

nerve stimulant and exerts its influence on the mucous layer of t dermis. In the acute stages, when rapid cell changes are taking accompanied by heat, burning, and intense itching, the drug never be administered, as it stimulates the already inflamed r layer when rest is desired. Generally speaking, this rule hold for the acute inflammatory stages of any disease of the skin. In asis, for example, the drug should be withheld while the dis rapidly spreading and until the acute symptoms have sul Arsenic is never to be used against the skin-lesions themselves, b in well-selected cases, when the underlying cause of the disea debilitated or run-down condition of the nervous system. The r is best administered to children in the form of liquor sodii ar 1/2- to 2-minim doses, according to age, well diluted. This solu less disturbing to the digestive tract than the potash salt.

Thyroid extract yields remarkable results in some cases. probably due to the stimulation of katabolic activities. eczemas so common in cretins and in the mentally deficient Mongolian type, thyroid may act as a specific.

Differential diagnosis may be made between eczema anc disorders which often resemble it by comparing the following adr tables (from Van Harlingen):

Eczema Erythematosum	Erysipelas
1. Not contagious; frequently history of eczema elsewhere.	1. Frequent history of contagio
2. Accompanied by mild symptoms.	2. Well-marked constitutional toms.
3. Little or no edema, but some infiltration, shown by the thickness of the skin on pinching up a roll between the fingers. Surface dull and red and often slightly scaly.	3. Shining redness; skin tense; edema.
4. Not a creeping disease, though it may spread irregularly.	4. A creeping eruption, spread ipherally.
5. Inflammation less acute and more superficial.	5. Inflammation very acute a seated.
6. Itching perhaps more marked than burning.	6. Intense burning and little pr
7. Not apt to be painful on pressure.	7. Usually very painful on pres
8. Not infrequently some secretion at one stage or another.	8. No discharge except from blebs.
9. Vesicles form early, if at all.	9. Vesicles, or rather blebs, forn
10. Runs a chronic course.	10. Runs a rapid course.
11. No line of demarcation.	11. A distinct line of demarcatio
12. No rise of temperature.	12. Always a rise of temperature.

Eczema Papulosum	Urticaria
History of eczema.	1. Often a history of error in diet, or dyspepsia.
Eruptions may appear more gradually.	2. Eruptions appear suddenly.
Often extensive.	3. Usually not extensive.
Lasts usually for weeks.	4. The separate attacks may last but a few hours.
Absence of blood crusts, excepting in connection with the papular lesions.	5. Frequent presence of blood crusts from scratching the only evidence of the disease.
Usually accompanied by other forms of eczema.	6. Not accompanied by other forms of eruption elsewhere.
Itching severe. Not so much burning as pricking. Not so markedly aggravated by currents of air, etc.	7. Itching, tingling, pricking, and burning intense. Usually aggravated by currents of cold air, undressing, etc. Often intense nervousness.
Eruption remains the same for days.	8. Exacerbations may occur in a few hours.
Skin not especially irritable.	9. Welts form immediately on irritation of the skin.

Eczema Vesiculosum	Herpes Zoster
Begins with slight burning or itching.	1. Neuralgic pains a premonitory symptom.
Vesicles seldom form distinct groups.	2. Vesicles are arranged in distinct groups.
Vesicles tend to run together.	3. Vesicles markedly distinct and independent.
Vesicles small.	4. Vesicles large.
Vesicles tend to rupture.	5. Vesicles do not rupture spontaneously.
Formation of crusts.	6. No crusts unless vesicles are accidentally ruptured.
Eruption accompanied by more or less intense itching.	7. Burning pain, often lancinating, accompanies the eruption.
No special arrangement of lesions.	8. Eruptions follow the course of some nerve.
Eruption occurs on both sides.	9. Eruption limited to one-half of the body.

Eczema Squamosum.	Pityriasis Capitis
Presence of moisture at some time.	1. Always a dry disease.
Skin red and thickened.	2. Skin not thickened nor inflamed.
Scales more firmly adherent.	3. Scales easily detached.
Ears frequently attacked.	4. Disease limited to scalp.
Alopecia less frequent, and the hair usually returns after the eczema is cured.	5. Frequently more or less baldness ensues after a time.
Hairs frequently matted together.	6. Hairs surrounded by a scaly sheath.

Eczema Squamosum	Psoriasis
1. Eruption fades gradually into surrounding skin.	1. Patches of eruption sharply def
2. Scales thin and scanty.	2. Scales thick and abundant.
3. Presence of moisture at some stage.	3. Eruption always dry.
4. Lesions change in character from time to time.	4. Eruption remains the same week to week.
5. Scales small and yellowish.	5. Scales large and pearl-like.
6. Intense itching.	6. Itching less severe.
7. Patches of eruption large and irregular.	7. Patches of eruption smaller round.
8. No seat of predilection.	8. Seat of predilection on knees, el etc.
9. No uniformity of lesions.	9. Great uniformity of lesions.
10. Considerable induration of patches.	10. Less induration, but greater v larity.
11. Ears and face frequently attacked in eczema of the scalp.	11. When affecting scalp, usually li to hairy parts, just extending t edge and limited by an abrup of demarcation.

Eczema Papulosum.	Lichen; Ruber Planus
1. No desquamation.	1. Desquamation.
2. Lesions remain papular for weeks.	2. Remain papular for months.
3. Severe itching.	3. Usually slight itching.
4. Papules rounded and more or less acuminate.	4. Papules flat, slightly depressed, some umbilication in the center.
5. Papules rounded in outline.	5. Papules have a peculiar squari angular outline.
6. Color of lesions bright red.	6. Color of lesions dull red or violac
7. Lesions irregularly arranged.	7. Lesions seem sometimes to f nerve-trunks.
8. Little or no subsequent pigmentation.	8. Lesions have some pigmentatio staining.
9. Papules often unite, losing their identity.	9. Papules retain their individu although forming patches.
10. Health remains good in most case.	10 Health often impaired.

Eczema Squamosum	Pityriasis Rubra
1. Redness occurs in patches.	1. Uniform redness.
2. Intense itching and some burning.	2. Slight itching and no burning.
3. Scales small and bran-like.	3. Scales large and papery.
4. Scales form slowly.	4. Scales reproduced rapidly.
5. Skin infiltrated and thickened.	5. Skin not infiltrated.
6. Exudation present at some period.	6. Process always a dry one.
7. Scales not very abundant.	7. Scales very numerous.
8. Affection common.	8. Rare disease.
9. General health remains good.	9. Severe constitutional disturbance disease has lasted some time.

Eczema Squamosum	Tinea Circinata
1. Eruption usually irregular.	1. Eruption circular in form.
2. Margins ill defined.	2. Margin well-defined and raised.

ECZEMA SQUAMOSUM—(*Continued*)

3. Scaling bran-like and abundant.
4. Not contagious.
5. Irregular character of eruption.
6. Does not heal from center.
7. Usually a chronic affection.
8. Non-parasitic disease.

ECZEMA PUSTULOSUM

1. Non-parasitic disease.
2. Not communicable.
3. No peculiar odor.
4. Exudation purulent.
5. No permanent loss of hair.
6. Hairs appear normal.
7. Eruption never ends in ulceration or cicatrization.
8. Crusts moist and sticky.
9. Acute course of disease.

ECZEMA PAPULOPUSTULOSUM

1. Non-parasitic disease.
2. No burrows.
3. Not communicable.
4. Vesicles and pustules confluent.
5. Eruption sudden and not progressive.
6. Vesicles clear.
7. Pruritus less severe.
8. No special seat of election.
9. Scalp may be affected.
10. Individual lesions usually small.
11. Vesicles usually rupture.

ECZEMA ERYTHEMATOSUM

1. History frequently of eczema.
2. Eruption limited in extent.
3. Patches of eruption quite large.
4. Intense itching.
5. Lesions bright-red color.
6. Usually accompanied by other forms of eczema.
7. Slight scaling, but no pigmentation.
8. Skin thickening.

TINEA CIRCINATA—(*Continued*)

3. Slight, shreddy desquamation.
4. Communicable.
5. Eruption ring-shaped.
6. Tendency to heal from center.
7. Disease runs an acute course.
8. Presence of mycelium under the microscope.

FAVUS

1. Peculiar vegetable parasite to be found in abundance under microscope.
2. Contagious.
3. Lesions have a characteristic mouse-like odor.
4. Exudation dry and powdery; canary-yellow lesions, cup-shaped, hair protrudes through center of cup.
5. Eruption gives rise to scars and alopecia.
6. Hairs brittle, dry, and wiry.
7. Disease may result in cicatrization.
8. Crusts dry and friable.
9. Very chronic affection.

SCABIES

1. Presence of parasites.
2. Presence of burrows, pathognomonic.
3. Very contagious.
4. Vesicles, papules, and pustules discrete.
5. Eruption progressive.
6. Irregular dots on vesicles.
7. Itching intense, especially at night.
8. Lesions found especially between fingers, on flexor surface of the wrists, on anterior folds of axillæ, about nipples, on shaft or head of penis, buttocks, popliteal spaces.
9. Disease very rarely affects scalp; this does not apply to infants.
10. Vesicles and pustules often very large.
11. Vesicles do not rupture spontaneously.

SYPHILODERMA ERYTHEMATOSUM

1. History of chancre.
2. Eruption diffuse.
3. Individual lesions small.
4. Rarely much itching, if any.
5. Coppery, fawn, or pale-rose color.
6. Presence of other syphilitic symptoms.
7. No scaling, but pigmentation.
8. No induration of the skin.

Eczema Papulosum

1. History of eczema.
2. Eruption usually limited in area.
3. Superficial eruption.
4. Eruption usually moist at one time or other.
5. Severe itching.
6. Lesions less distinct.
7. Vesicles not infrequently associated with papules.
8. Lesions more acute and active.
9. Lesions tend to group and unite.

Syphiloderma Papulosum

1. History of syphilis.
2. Eruption extensive.
3. Eruption deep-seated.
4. Eruption dry from the first.
5. Little or no itching.
6. Lesions have a firm, shotty feel.
7. Distinctly papular.
8. Lesions chronic and passive.
9. Lesions usually discrete.

Eczema Squamosum

1. History of eczema.
2. Eruption superficial.
3. Intense itching.
4. Eruption moist at one time or another.
5. Eruption red in color.
6. Scales abundant and thick.
7. Infiltrations less marked and inflamed.
8. Margins indistinct and not abruptly elevated.
9. Heals first at edges.
10. Lesions active and inflammatory.
11. No secondary lesion except large, painful glands in neighborhood of eruption.
12. Eruption has an irregular outline.

Syphiloderma Squamosum

1. History of syphilis.
2. Eruption deep-seated.
3. Slight itching.
4. No discharge.
5. Eruption ham-colored.
6. Scales scanty and thin.
7. Infiltration of skin marked cellular.
8. Margins elevated and well defin
9. Tendency to heal at center.
10. Lesions passive and but slightl flamed.
11. Presence of secondary lesions.
12. Tendency to occur with circular line.

Eczema Pustulosum

1. History of eczema.
2. Often itching.
3. No bad odor.
4. No ulceration.
5. No scarring.
6. Eruption usually confluent in large patches.
7. Scales less prominent and never stratified.
8. Vesicles present at some stage.
9. Eruption develops rapidly and disappears sooner.
10. Crusts moist.
11. Scales less adherent.
12. Absence of secondary lesions.

Syphiloderma Pustulosum

1. History of syphilis.
2. Itching absent or moderate.
3. Odor very disagreeable.
4. Ulceration under crusts.
5. Lesions leave scars.
6. Lesions discrete or form small, ir ular patches with circular outline
7. Scales prominent and often in form of rupia (oyster-shell like).
8. Pustules usually occur alone.
9. Lesions develop slowly and last k
10. Crusts dry.
11. Scales adherent.
12. Presence of secondary lesions.

ERYTHEMA

Six varieties of erythema are worthy of mention: Erythema simplex, erythema intertrigo, erythema vaccinium, erythema variolosum, erythema multiforme, and erythema nodosum.

The first four are simply hyperemias, with little or no inflammatory exudation, while the last two are characterized by more or less plastic exudation. They all terminate without leaving a mark or scar. *Erythema simplex* is characterized by redness, occurring in patches, from whatsoever cause, in form of variously sized, diffused or circumscribed areas.

Varieties.—(1) Irritations caused by heat or cold, pressure or rubbing, irritating or poisonous substances; (2) symptomatic, due to some systemic disturbance, as disorders of the digestion or the blood. The *treatment* is the removal of the obvious cause, local or internal; locally, soothing or astringent lotions; bran decoction with soda with, it may be, a few drops of carbolic acid. The calamin lotion has a wide range of usefulness:

℞. Pulv. calamin ..... ʒ iij
Pulv. zinci oxidi ..... ʒ ij
Glycerin ..... ɱxl
Liq. calcis
Aq. rosæ ..... āāfl.ʒij.

Ointments are apt to disagree and are less cleanly.

Erythema Intertrigo.—A common form of irritation occurring on the natural folds of the skin where these come in contact with each other and chafe, as about the buttocks, groin, and armpit. The skin feels hot and looks sore; perspiration macerates the epidermis and may cause an acrid, mucoid discharge; the cause is usually mechanical, by the rubbing together of two surfaces of skin or the contact of rough clothing, acid urine, salt sea-water, sweat, or irritating discharges.

Erythema intertrigo in an infant may resemble an erythematous hereditary syphiloderm, and an opinion should not be hastily expressed. At first the syphilitic eruptions disappear under pressure, but in the course of a few weeks the lesions become more marked, and appear in other portions of the integument than the natural folds, the lesions becoming infiltrated and change in color to a deep, yellowish-red, and moist papules will show themselves. Mucous patches, fissures of mouth and anus, sniffles, hoarseness, wizened appearance, etc., will readily make clear the diagnosis.

The *treatment* is cleanliness and care to keep the parts asunder.

Smooth bits of linen or wads of absorbent cotton placed in between are comforting and preventive.

℞. Pulv. acid. boric..... 3j
Pulv. talc..... 3j.

This is a powder which will not ferment. Calamin lotion is also useful.

Certain other powders are useful: Oxid of zinc, stearate of zinc, bismuth, magnesia, fullers' earth, and calamin. In stubborn cases black wash diluted with lime-water, dilute alcohol, with alum or sulphate of zinc (weak solution: zinc sulphate, 1/2 to two grains; water, one fluidounce), followed by a powder, are useful. If hyperhidrosis occurs about the genitalia, etc., belladonna may be added to the lotions. If the digestion of a child is disturbed, alkaline laxatives and diuretics may be given, to which a bromid may be advantageously added.

Infantile erythema (roseola), common in infants suffering from gastric disturbance or febrile complaints, occurs chiefly on the trunk, and may be mistaken for scarlet fever or measles.

Erythema vaccinium (roseola vaccinia) occurs frequently a day or two after vaccination, extending over the trunk and extremities, and sometimes induces the fear of syphilitic infection. This last has a much longer incubation period, and is of a dusky red.

Erythema variolosum, one of the prodromal rashes of smallpox, appears in a characteristic locality, over the abdomen and inner side of the thighs, the dorsal surfaces of hands and feet, and the axillæ. It may be accompanied by redness of the pharynx. In a few days the diagnosis will be made clear.

Erythema multiforme is very like erythema simplex, but more severe; it manifests itself as erythematous patches of most varied shapes and sizes, or as papules, vesicopapules, and tubercles, scattered or in groups. The papular type is the most common. With or without symptoms of malaise or rheumatic pains the lesions appear suddenly. These soon fade and seldom last longer than a week or ten days; though very severe looking, the lesions disappear spontaneously, leaving perhaps slight pigmentation or desquamation. They occur symmetrically, are usually seen on the backs of the hands, feet, and knuckles, but may be more or less general, appearing in the spring and fall. As a rule, no subjective symptoms are complained of.

Erythema iris is erythema multiforme when we have a play of colors in the lesions. One or more rings concentrically arranged may appear, giving the lesion a target-like appearance.

s *iris* is simply erythema iris gone on to vesication. Here serous exudation has taken place to raise the epidermis issues beneath in the form of vesicles or bullæ.

reatment of erythema multiforme is very simple—quinin, , mild saline laxatives and diuretics, a carbolic acid wash ee drams to the pint of camphor water, adding a little gly- perhaps, soda; dusting-powders may be used.

ema nodosum is an inflammatory disease characterized by r oval, more or less elevated reddish nodes. It is ushered e systemic disturbance and rheumatoid pains, with swellings e joints. The nodes appear suddenly on any part of the commonly on the legs and arms, especially over the tibia, xis of the node, parallel to the long axis of the tibia usually. in size from that of a small nut to that of an egg, are usually vated, are reddish at first, tending to become purple or blue, ey disappear turn yellow, simulating bruises. When the at their height they look as though they contained fluid, may be hemorrhagic. They never suppurate. The dis- s most frequently in children and young adults. The lesions in crops from a few to a dozen or more, usually attended tion of heat, and are tender on pressure. The duration is to four weeks.

eatment is constitutional and local. Salicylates are called locally, soothing applications—lead-water and laudanum, tations. Rest, absolute or relative, according to the severity ck and the region affected, is indicated.

FURUNCLE

Synonym.—Boil

le, commonly known as boil, is a deep-seated inflammatory aracterized by one or more variously sized, circumscribed, mall rounded or acuminated, firm, painful formations, usu- nating in a central suppuration. Boils may occur singly, in often in successive crops. The lesion begins as a small, ill- d spot in the true skin, tender and painful from the first, larger, elevated, and showing a tendency to suppurate about . It matures in about a week or ten days in a slightly raised formation, with a suppurating center, called the core. This not form, and it is then called a "blind" boil. It usually a dull, throbbing pain, which increases until suppuration

takes place, and then subsides. Sometimes there is sympathetic constitutional disturbance; neighboring glands may be enlarged. Boils not seldom occur in the course of other diseases, and occasionally at certain seasons, as in the spring and autumn, appearing as an epidemic. Boils differ from anthrax or carbuncle in having but one point of suppuration; the carbuncle has many, is flat, varies in size from half an inch to four inches in diameter, and while painful, is not tender, as furuncle is.

Frequently in children there occurs the condition known as furunculosis, or crops of usually small pea- to bean-sized or larger phlegmonous papules or papulopustules. These run their course, fresh crops appear, and thus the process continues, sometimes for long periods, if untreated. These boils do not form any definite group; they are usually scattered over one or several portions of the body, are usually isolated, and occur on the trunk, limbs, forehead, and scalp. They are frequently connected with excessive sweating. We have seen them in infants follow an attack of miliaria papulosa (prickly heat), and exist in considerable numbers.

Treatment. *Vaccine Therapy.*—It is in the treatment of boils and carbuncles that "bacterins" have yielded their most brilliant results. Theoretically, it is best to employ autogenous vaccines; but stock "staphylococcic" or "mixed" vaccines have yielded splendid results in a number of instances. We rarely inject more than 100,000,000 at a time, and when opsonic studies are not pursued, we never give a second injection in less than four days. Usually from two to four injections suffice in the treatment of furuncles. The next object is to destroy the cocci in each boil, and thereby exhaust the supply. Open the pustules surgically[1] and gently express the pus (rough handling of a small boil may readily convert it into a large one), after which apply three or four times daily the following, which we have used with marked benefit and can highly recommend:

℞. Ichthyol ..... mxx
Acid. boric ..... gr. xx
Aq. destil ..... fl. ʒj.
M. Sig.—Apply to surface, using an atomizer.

Used thus, the application causes no pain to the infant or resistance of the little sufferer, and new crops will not appear, as the soil is made unfavorable to the growth of the staphylococci.

[1] *Note.*—A splendid painless method is the following: Touch the pointing area with re carbolic acid. Painless punctures may then be performed through the anesthetized a. Wipe out the furuncle with pure carbolic, avoiding excess. Alcohol will prevent ming of the adjoining skin.

e disease is regarded as due to the micrococci, especially the ococcus aureus, invading the sweat-glands or hair follicles. il also must be favorable for their development. This is usually in a lowered opsonic index for staphylococci.

ce the staphylococcus pyogenes aureus has been demonstrated he cause of boils, parasiticides have come into use.

e following plaster spread on and kept in place is claimed to be

Acid. salicylic	ʒ ij
Emplast. sapon	ʒ ij
Emplast. diachyl	ʒj.

—Spread on cloth or kid, a crossed slit to be cut in this over the apex of the boil.

thyol ointment, 12.5 to 25 per cent., in lanolin and petrolatum, l in persistently for ten minutes, is one of the best means of ıg the local inflammation. When pus has once been formed, cision should be made. Bulkley praises a mixture of—

Acid. carbolic	gr. x
Ext. ergot. fluid	ʒj–ij
Ung. zinci oxid	ʒij–iv.

oxid of hydrogen is then useful, not only as a cleanser, but as an tic. This had best be applied in full strength upon absorbent at the end of a probe or stick or wire applicator. If poultices ed—and they are often a great comfort—they should contain cid and, possibly, corrosive sublimate (1–2000).

HERPES ZOSTER

Synonyms.—ZONA; SHINGLES

ıa, or shingles, is an acute inflammatory disease, characterized ıps of vesicles seated upon inflamed bases, following the distri- of cutaneous nerves and accompanied by more or less neuralgic The vesicles vary in size from that of a pinhead to that of a ea, and they may coalesce, but the patches do not show this cy. The eruption is almost always unilateral, and occurs over ily traced nerve-trunk. New lesions continue to appear until ırth or eighth day, remaining thus a few days, then gradually , leaving brown crusts. Ten to twenty days is the average dura- an attack. The distress may be very slight or overpowering. neuralgic pains occurring before the eruption manifests itself ve rise to the diagnosis of pleurisy, pleurodynia, or other local- ıffering until the characteristic eruption of zoster makes the sis clear. Of late years herpes zoster is being regarded as a

more complicated affection than it was for a long time believed to be. The causal factors are: (1) Inflamed state of the nerves, ganglia, nerve-trunks, branches, or filaments; (2) season—most frequent in winter; (3) sudden temperature change; (4) infection; (5) internal use of arsenic (Hutchinson); (6) traumatism following injuries or surgical operations.

The infectious diseases that are most commonly accompanied by herpes are epidemic meningitis, pneumonia, malaria and epidemic influenza. They are rare in typhoid fever.

The **diagnosis** of herpes zoster can be made upon the prodromal neuralgic pain, but, as a rule, this is absent in the young; the vesicles tend to cluster in distinct groups upon a highly inflammatory base, and occur on a nerve tract, and unilaterally almost always, and the vesicles preserve their form intact. In eczema the lesions exude moisture, break down, and form crusts; in herpes zoster there is no discharge unless the vesicles are ruptured; they dry up and form crusts. Eczema itches; herpes zoster burns.

The **treatment** of herpes zoster is largely palliative; it is an acute, self-limited disease, running a very variable course. The neuralgic pain in children may be entirely absent, and if it is present, is liable to subside as the eruption becomes established. The main points are to prevent the vesicles from rupturing, to exclude the air, and to prevent the irritation of the clothing. Internally, the coal-tar analgesics are usually efficacious to control the pain. A powder of acetanilid or phenacetin, three grains; bicarbonate of soda, two grains; caffein, 1/2 grain; codein, 1/10 to 1/6 grain, every three hours, is useful for a child of ten; sometimes morphin is necessary. Bromids may be needed where nervousness is extreme.

For local use, the following is recommended:

℞. Pulv. camphoræ ..... gr. x
Pulv. talc ..... ʒj.
Sig.—Use locally.

The dusting-powder should be very freely applied to the surface and held in place by a large wad of cotton-wool to keep the whole from being moved about on the hypersensitive surface, and to avoid rupturing the vesicles, as infection may take place in the broken-down lesions and scarring result.

For localized patches menthol or resorcin in gutta-percha or collodion are excellent protectives. For extensive areas, especially about the gluteal folds, in the axillæ, lotions, as of laudanum, laudanum and lead-water, or fluid extract of grindelia robusta, diluted with

water, give comfort. On limbs which must be used, ointments can be made to serve a good turn, or oil of peppermint or chloral camphor painted on, over which a large shielding wad of cotton should be placed and firmly attached.

An important point in treatment is the residual neuritis, for which galvanism gives relief, or sometimes blisters on the central side of the nerve affected are useful. Salicylates, in full dosage may also give relief.

IMPETIGO CONTAGIOSA

Impetigo contagiosa is a highly contagious, autoinoculable disease, very common among children and almost entirely confined to them, running its course in about ten days or two weeks, and tending toward recovery. It may be defined more accurately as an acute, inflammatory, contagious disease, characterized by the formation of one or more superficial lesions, round or oval in shape, beginning as vesicles and rapidly becoming pustules which pass into crusts. At first the vesicles stand alone and are small in size, but soon spread out until they become the size of a small coin, over the top of which is spread out a thin membrane, soon becoming collapsed and withered looking. There may be few or many of these, alone or coalescing, especially about the angles of the mouth and around the ears or nose. In a few days yellowish or straw-colored crusts form which have the appearance of being loosely "stuck on" the skin, and are readily pulled off, leaving a moist, bleeding, or inflamed surface underneath. The course is about ten days, but we have seen it run along for weeks in much the same locality, doubtless by progressive autoinoculations. This last is a very common method of extension, and we have frequently seen painful lesions on the body, about the buttocks, or under the armpits, and particularly on the lower leg, which could be directly traced to an earlier mild attack of impetigo beginning upon the face, for which no treatment had been sought. The cause is the staphylococcus flourishing on favorable soil. Impetigo is so well marked a disorder in its distribution, occurring as it does usually on the face and hands and beginning as flat, flaccid vesicles or vesicopustules, the dirty appearance of the pustules, the yellowish-brown, loosely attached scabs or crusts, the absence of itching, there are so constantly two or more children in a family affected with it at the same time, or there is an easily obtainable history of neighboring infection—that there should be little difficulty in differentiating it from pustular eczema, scabies, or that rare and illusive entity known as simple impetigo.

variety of miliaria rubra. Here the inflammatory process is primarily in the sweat-glands and causes obstruction of the sweat-ducts. The eruption consists of bright-red, minute, closely crowded, but not confluent acuminate papules, with a few vesicles and vesicopapules scattered about between them. The eruption is preceded by profuse sweating, comes out suddenly, and is attended with intense itching and pricking. It mostly affects covered parts—trunk, limbs, and upper part of forehead—and is usually extensive. Prickly heat is most common in the tropics, but occurs in America during the summer. Too warm or ill-fitting clothing, the irritation of clothing, especially flannel, rapid alterations of temperature, seem to be predisposing factors. Children, fat people, and those who perspire freely are most liable to it. One attack predisposes to another.

Diagnosis.—The non-inflammatory, pearly vesicles of sudamina can scarcely be confounded with anything else. Miliaria vesiculosa may be mistaken for vesicular eczema, but in the latter the vesicles rupture spontaneously; they form in patches, oozing is usually marked, and the process has a distinct tendency to spread, and is more chronic in its course. Miliaria papulosa, occurring only in hot weather, its sudden onset, associated with excessive sweating and the eruption confined to the sweat-glands, the minute papules, peculiar pricking instead of intense itching sensations—all differentiate this from eczema papulosa.

Differential Diagnosis.—Sweat rashes occurring in children are liable to be mistaken for some of the exanthemata, but the absence of the usual constitutional symptoms of measles, scarlatina, and Rötheln, and keeping in mind the localization of the eruption and the accompanying sweating, will usually make the diagnosis clear.

The **prognosis** is good, the disorder generally yielding to appropriate treatment.

Treatment.—Saline diuretics—acetate and nitrate of potash—and lemon- and lime-juice drinks are very useful. Locally, alkaline and bran baths are beneficial; soothing, cooling, or evaporating lotions will afford relief. We have used with marked benefit the lotion of resorcin and bismuth (see Eczema) and the calamin lotion. (See Erythema.) Dusting-powders of zinc, starch, and boric acid are useful. Silk and linen-mesh underwear are important for prophylaxis.

PEDICULOSIS

Pediculosis (lousiness) is a parasitic affection caused by the presence of lice. There are three varieties of pediculi—of the head,

body, and pubes. The diagnosis is easy, when the scratch-ma are carefully searched for. In the hairs of the scalp and pubes, nits, ova, will be conspicuous. The parasite attacks the scalp and prod considerable irritation, which causes the patient to scratch; then lows effusion of serum, blood, or pus, the hairs becoming matted gether. Pediculosis is a common cause of eczema in the back of head. Sometimes a characteristic form of eczematous eruption be seen about the mouth, nostrils, and ears, due to lice, but cl resembling impetigo contagiosa. Sometimes lice are found in eye-lashes.

The **treatment** for head-lice is to apply kerosene or tinctu cocculus indicus overnight, and wash the hair with soap and wat the morning. This will kill the insects, but does not destroy the Vinegar applied will soften the ova and aid in their removal. hair need not be cut if care and patience are used in applying remedies.

Body-lice produce considerable itching, which is usually foll by extensive scratches. Cleanliness with soap and water is us sufficient in the care of children; the underclothing must be bak boiled. This insect lives in the clothing, and only goes to the bo feed. A carbolic lotion may be necessary to relieve itching.

The crab-louse, though usually found on the pubes in the a is sometimes met in the other hairy parts, as the axillæ, but is rarely met in children, and then in the eyebrows and eyelashes. insect may be removed by cocculus indicus of full strength or di one-half, followed by vinegar or hot soapsuds, or, better,

℞. Hydrarg. bichlor..... gr. j
Acid. acet. glacial..... ♏xx
Aquæ.....ad ℥j.
M. SIG.—Apply.

This is the most neat and elegant preparation, as the bichlori stroys the insect and the acetic acid dissolves the nit, which can th readily removed by a fine-toothed comb.

PITYRIASIS ROSEA

Pityriasis rosea is a slight affection, self-limited and harmless worth mentioning because it is frequently mistaken for more in tant disorders. It is characterized by discrete or confluent ma or maculopapular lesions, from a pea to a half-dollar size; in c rosy or pale red, with a more or less tawny or yellowish tint. Th

[1] Nits adhere to the hair shafts, standing on an angle, much like a spear Dandruff is readily removed from the hair shaft.

face may be slightly or not at all raised, always dry or scaly, healing in the center and spreading at the edge, and when there is caused a ring-like appearance, it may be confounded with tinea circinata. The eruption is usually seen under the clavicles, on the side of the chest, or between the shoulders. It may be mistaken for syphilis, tinea versicolor, tinea circinata, or seborrhœa corporis; it may last from one to three months. It is not contagious and requires little treatment, except, perhaps, a mild, stimulating ointment such as—

℞. Acid. salicylic..... gr. x
Sulph. præcip..... gr. xx
Ung. aq. rosæ..... ℥j.

PSORIASIS

Psoriasis is a chronic inflammatory disease of the skin, commonly showing itself in the form of variously sized scaly patches scattered over different parts of the body; these patches are usually rounded, sharply defined, and are covered by a mass of imbricated "mother-of-pearl" scales on a red base. When the scales are picked off, there is shown underneath a smooth, shiny, reddish surface, on which may be seen a few bleeding points. Psoriasis is always dry and scaly, never moist. It may occur in any part of the body, but most commonly on the extensor surfaces of the limbs, and especially on the knees and elbows. The back is a favorite situation, and it is frequently seen in the scalp. It is non-contagious, and may occur in healthy, well-nourished people or those who are slightly rheumatic. Its subjects may be constipated or show other evidences of intestinal auto-intoxication. It is almost always symmetric; there is, as a rule, little or no sense of itching. In children the lesions are usually small and rather generally distributed. The elbows, knees, and scalp are liable to be the first parts attacked. A diagnosis needs to be made between psoriasis, seborrhea, eczema, and syphilis. In seborrhea of the scalp the scales are greasy and yellowish and they are not situated on an inflammatory base, and are limited to that region, and the scaling or crusting is diffuse and not in patches. In psoriasis the scales are usually profuse and mother-of-pearl colored, and are situated on inflammatory bases and occur in patches which are circumscribed. Psoriasis is hardly ever confined to the scalp, other lesions being found, especially on the extensor surfaces of the knees and elbows. In the squamous syphilids it should be noted that these are rarely confined to the joints and extensors, where patches of psoriasis in children are usually seen. Psoriasis is notably a disease of the colder months, at least in its early course.

The **prognosis** is favorable for the cure of the existing lesions, but as the disease is very liable to recur sooner or later, a guarded opinion as to ultimate cure must be given. It is one of the bugbears of dermatology.

Treatment.—Internally the chief remedy is arsenic,[1] which is of undeniable value and is well borne by children. It should not be prescribed until the acute inflammatory symptoms have subsided and while the disease is rapidly spreading. The scales should be removed before local treatment is attempted. This may be accomplished by rubbing in, with a rag, sapo viridis and hot water, or by the prolonged use of a hot-water and soda bath.

About the face and the scalp a good ointment is ammoniated mercury, twenty to forty grains to the ounce of lanolin and cosmolin. Chrysarobin is most efficacious, but should be used with caution, as it may set up a spreading dermatitis. A good application is:

℞. Chrysarobin..... gr. x
Acid. salicylic..... gr. xx
Liquor gutta perchæ..... ʒj.
Sig.—Apply with a camel's-hair pencil every third or fourth day, to be followed by a bath.

Another good application is tar, one to four drams to petrolatum one ounce.

Colonic flushings with normal salt solution have proved of value in some cases.

SCABIES

Synonym.—The Itch

Scabies is a contagious parasitic disease, due to the acarus scabeii, characterized by a multiform eruption of a *peculiar distribution* and the presence of cuniculi, or burrows, which, if found, are pathognomonic. The depredations are wrought by the female, who burrows just below the surface of the skin, deposits feces and eggs, and there dwells. As soon as the young are hatched they start out energetically likewise to burrow. These burrows are seen as zigzag or straight dotted linear elevations of the epidermis, and are found between and on the sides of the fingers and on the flexor surface of the wrist; also on the penis in males.

As the mite seeks warm, moist, and protected places for its habitat, this disease therefore has its own peculiar distribution, viz.—between the fingers, on the flexor surfaces of the wrists, anterior folds of the axillæ, and on the abdomen and buttocks. Except in infants and young children, the face and scalp are free.

[1] Thyroid has proved of signal service in a number of cases.

The **diagnosis** is usually easily made from the history of contagion often given, the peculiar distribution of the dermatitis, the multiformity of the lesions (burrows, vesicles, papules, pustules, scratch-marks, and blood crusts), the marked itching, especially at night, and, except in infants, the freedom of the scalp and face from invasion. In children the burrows are usually readily found, and when seen, they are pathognomonic.

Treatment.—The itch itself is not difficult to cure, but the resulting eczema or dermatitis may be troublesome. Too little treatment, on the one hand, and too much or too vigorous, on the other, is to be deprecated. (For the dermatitis resulting from the irritating application see Eczema and its treatment.)

The first thing to do is to give the child a thorough bath in hot water and soap, to soften the epidermis and open up the burrows, and then apply the following ointment every night for four nights, rubbing in thoroughly from head to feet:

℞. Sulph. præcip.,
Bals. Peruv.....āā ʒj
Petrolat..... ʒj.

r:

℞. Beta-naphthol..... ʒ ss–j
Unguentum adipis..... ʒj.

On the next night following the fourth application give another th, to remove the ointment, débris, etc. Allow the patient then to without any applications for three or four days, as a dermatitis y have been set up from the irritating parasiticides. This will n subside in a few days. The disease may not have been cured, or ne of the mites may have escaped; if so, a second course of treatnt for four days will almost certainly cure the disease.

In young infants the remedies outlined above may be too irritating, ıce styrax is to be used, pursued as directed for the older children:

℞. Styracis liq..... ʒ j
Ol. olivæ..... ʒ ij.

Sig.—Apply at night for two or three nights.

The patient's bedding should be boiled, and he should use separate wash rags and els.

SEBORRHEA

Seborrhea is a functional disease of the sebaceous glands of the in, characterized by an increase in the amount of sebum poured t of an alteration in its quality, in the form of oily, scaly, or crusted ıterial. There are two varieties, seborrhœa oleosa and seborrhœa :ca.

Seborrhœa oleosa appears in the form of a greasy coating on the skin, most commonly on the scalp and face.

If the vernix caseosa of the new-born continues, it may pass into seborrhea, and this, if neglected, may run into an eczema. Smegma of the genitals is a form of the same disorder, and if excessive or unremoved, it produces considerable discomfort and perhaps balanoposthitis. The treatment of seborrhea is both constitutional and local, those suffering from the disorder being usually in a depraved state of health. After infancy it is most likely to appear about the time of puberty. Functional disorders should be attended to and nutrition kept at a high plane. The local treatment consists of removing the scales and crusts. The best application is salicylic acid 15 grains, petrolatum one ounce, left on over night, and then wash with hot water and Castile soap.

Sulphur is the most reliable remedy for seborrhea—one dram to one ounce of petrolatum in an ointment rubbed into the scalp. The German superfatty sulphur salicylic soaps form an elegant mode of applying sulphur to the scalp. They can now be had in most drug shops.

VEGETABLE PARASITES OF THE SKIN

The vegetable parasitic diseases most commonly met with in childhood are ringworm and tinea favosa. Tinea versicolor occurs so rarely that no consideration need be taken of that affection.

TINEA TRICHOPHYTINA

Synonyms.—TINEA TRICHOPHYTINA TONSURANS; RINGWORM OF THE SCALP

Ringworm occurs in the scalp up to the age of sixteen; after that the disease is practically unknown to infect this region.

Ringworm occurring in the scalp is not a trivial variety, like ringworm of the non-hairy portion. It is a stubborn and serious disease, frequently resisting for months, and sometimes years, the most persistent and intelligent treatment.

The **diagnosis** is usually made without any difficulty, but we have so frequently seen instances where the treatment prescribed in new cases has been poorly adapted, or perhaps so improperly carried out that these incipient cases, instead of being cured in a few weeks or months, have run on from bad to worse and lasted for years. These children spread the disease right and left, and inoculate others in the

me family, institution, or school, or, perhaps, the whole neighborod. Instead, had persistent and vigorous treatment been instiited and carried out from the very beginning, the disease would ave, it may be, been readily cured in a comparatively short time id have prevented the inoculation of others. Therefore, be it rememered, that no case of ringworm of the scalp should ever be slighted r made light of to the family or attendants.

Etiology.—The cause of ringworm is found in the growth and levelopment of a parasite or fungus. Until recently the trichophyton ungus was supposed to be the sole cause of this affection. Sabouaud, and others following him, have differentiated three great varieies, two of which are trichophytic, and a third a different species, iz.—microsporon audouinii. A full description of these several varieties may be found in the latest editions of the dermatologic works. The disease is very contagious, is very common, and is met with everywhere. Ringworm of the scalp is a disease of childhood, and is seldom seen after puberty. The disease is usually contracted from the lower animals, or from child to child through the medium of hats, caps, brushes, towels, wearing apparel, etc.

Symptoms.—Tinea tonsurans begins as a small, scaly, reddish pot, which grows peripherally from day to day. The epidermis, he hair, and the hair follicles become invaded by the fungus and a atch on the surface, which is rounded or irregular in shape, and aries in size from a pea to a dime or to a quarter-dollar or larger. he patch is circumscribed and partially bald. The hairs are lusterss, dry, broken off, twisted, bent, or fallen out. The follicles are rominent and have a "goose-skin" or "plucked-fowl" appearance. he larger patches are pale or grayish red, and distinctly thickened id scaly.

Itching is variable—it may or may not be present.

Microscopic Examination.—Select a few hairs from the edge of e patch—the lighter the color of the hair, the more readily the ngus, as a rule, may be found. Wash the hairs first with ether, to move any oil or grease, place in a watch crystal, and soak for twenty thirty minutes in liquor potassæ, place on a slide, and gently press it under a cover-glass. Examine with 200 or 300 power diameter; e mycelium and spores are usually well defined.

Tinea Kerion.—This is an inflammatory, suppurative form of ea tonsurans, characterized by edema, inflammation of a subacute pe, and exudation of a viscid yellowish secretion from the openings the hair follicles. The disease is deep seated.

Tumefaction may be present, and the tumors be cherry- to egg-sized. The patches are tender and painful, and fluctuation is often marked. These tumors should never be opened surgically. The hairs in the follicles are loosened by suppuration and are easily pulled out, or eventually fall out. This variety of disease frequently results in a natural cure. Sloughing never occurs. In severe cases permanent baldness may follow.

Treatment.—Crocker says: "There is only one remedy, viz.—perseverance." Parents and attendants should be made to comprehend how rebellious this disease is to treatment. Children with ringworm should not be allowed to attend school.

First, the hair should be closely cut for an inch around the patch; or, better still, the head shaved. Every third or fourth day pluck out with the fingers or forceps any loose or diseased hairs. The numerous stimulating parasiticides should be applied carefully to the patches and for an inch around the borders, and should be thoroughly rubbed into the tissues, as deeply as possible. If an ointment has been used, first clean the scalp with turpentine to remove the old grease. Wash the scalp every day thoroughly with ordinary soap, or, better still, soft soap or tincture of soft soap. The several remedies which have done the most good in our hands are: Ointments of precipitated sulphur, one dram to one ounce; beta-naphthol, one dram to one ounce; tar ointment, either alone or combined with the above; corrosive sublimate, 1:500 in solution, or two to four grains to ounce of ointment where not too large an area is involved; chrysarobin, ten to thirty grains to an ounce of ointment. Care should be used with this last remedy, as a spreading dermatitis may be set up. The head should be covered with a cap.

Prognosis.—A guarded prognosis should always be given—the disease often proving rebellious to treatment; months often are required to effect a cure.

TINEA CIRCINATA

Synonym.—RINGWORM OF THE BODY

Ringworm of the non-hairy surface as it occurs in children is very amenable to treatment, and may even run its course, terminating in spontaneous recovery. But should the fungus find its way into the hair follicles of the scalp, as frequently happens, the case is quite different. Usually the disease begins as a small, reddish, rounded scaly spot, growing from day to day by spreading at the periphery.

ıtch forms which is more or less circular, slightly elevated, and
l, covered with grayish, scanty, adherent scales. The margins
ply defined against the sound adjacent skin, and slight vesica-
small papules may be present on the circumference of the
. These patches tend to clear in the center and to spread on
iphery, assuming a ring shape; hence the name "ringworm."
rings may coalesce, and the patches may assume several
s of shape, viz.—oval, semicircular, or serpiginous. The patches
vorm may be in size from that of a pea to that of a half-dollar,
:olor may vary from pale to bright or dull red. In children the
are usually unsymmetric, and the subjective symptoms slight
ıt. Under the microscope the scrapings from a patch, placed
ass slide, adding a drop of liquor potassæ, and covering with
ıss and pressing down gently, will usually reveal mycelium
ıres. Tinea circinata may be mistaken for an eczema, but the
of contagion, the course and development of the sharply
ıl annular, slightly scaly patches, tending to clear in the center,
ıally, the microscopic findings, will usually make the diagnosis

ıtment.—In children local treatment alone, and remedies
ple character, as a rule, will suffice to effect a cure. Wash the
with soft soap and water, afterward applying a solution of
hyposulphite one dram, water one fluidounce; or corrosive
te, 1:1000 solution; or, in ointment form, one to two grains
ounce of petrolatum; or precipitated sulphur, 1/2 dram to two
:o one ounce of ointment of rose-water. Painting the single
ıith tincture of iodine, or with pure carbolic acid, is another
local treatment.

he disease is superficially seated, and therefore usually readily
are should be taken to select as non-irritating a remedy as pos-
ıat the skin in children be not irritated too much, as an ecze-
condition may be set up. Always apply the remedies care-
and around the spreading borders of the patches.

TINEA FAVOSA

:a favosa is a contagious vegetable parasitic disease due to
ıorion-Schoenleinii, characterized by discrete or confluent,
-sized, circular, cup-shaped, pale-yellow, friable crusts, com-
ıerforated by a hair.

seat of this disease is usually in the scalp, although the general

surface of the body and the nails may also be involved. The disease is fortunately extremely rare in American-born children, but is not uncommon in Russian, Italian, and Polish children, and is rarely encountered in any but the lower classes. Its customary seat is the scalp, but other portions of the skin, even the mucous membrane, may be invaded.

On the scalp the disease appears first as a small, sulphur-yellow disc, called a "favus cup," imbedded in the epidermis and seated about the hair follicles. They consist of almost pure fungus, and these crusts are splitpea-sized, dry, friable, and sulphur yellow in color, unless the hue has been masked by extraneous matter or blood or pus. They are seated superficially, and may be raised from the underlying skin. The skin beneath is depressed, smooth, shiny, atrophied, or perhaps suppurating, hence the disease leads to atrophy of the follicle and to loss of tissue and scarring, permanent baldness, therefore, following in some cases. The hairs are invaded with the fungus, and are dry, brittle, and split. If the disease is somewhat extensive, the peculiar "mousey odor" may be noticeable.

Microscopic Examination.—Take some of the crust and examine the same way as in ringworm. The mycelium and spores are readily detected.

The course of the disease is chronic, often lasting years, and relapses are common; therefore a guarded prognosis should be given.

Treatment.—Remove the crusts aseptically; depilate; and rub in thoroughly parasiticides, as in tinea tonsurans. The affected regions should be washed frequently. Sulphur, betanaphthol, mercurials, should be applied very much as in tinea tonsurans. There are some dermatologists who believe the disease is never cured.

URTICARIA

Synonyms.—HIVES; NETTLE-RASH

Urticaria is an inflammatory disease of the skin, characterized by the development of wheals, which are of various sizes and shapes, fugitive and ephemeral in character, white or reddish, accompanied by painful pricking and tingling sensations, and usually slightly elevated above the skin. On the face it may produce great disfigurement: a single part, as the lip, may become enormous. (Angioneurotic edema.) The disturbances of sensation may be merely annoying or overwhelmingly painful. The name "nettle-rash" alludes to its similarity to the sting of a nettle. The lesions may appear in almost

art of the body and shift about constantly. If the disease
s the epiglottis, it may threaten life. The duration depends
the persistence of the cause. The forms of urticaria are the
ar, hemorrhagic, bullous, or *urticaria tuberosa*, or *giant urticaria*.
y become chronic, the lesions coming and going in repeated crops.
causes of urticaria are many and diverse—*external* irritants, as
ings of insects and jelly-fish, and *internal* causes, the secondary
s of intestinal derangement. Certain articles of food produce it
ose predisposed, especially shell-fish, the sea scavengers, such as
ers and crabs, which frequently contain unusually severe poisons
ired from the carrion on which they feed. Some berries (notably
berries) produce it in the susceptible. Exciting causes may be
en emotion or excitement. The **treatment** depends chiefly
ie discovery and removal of the cause; some susceptible in-
uals have the disease developed within a very few minutes after
ig certain articles of food. We know a child, now twelve years
who for years has been so sensitive to any portion of egg that to
an article which contains this will produce, in a very few minutes,
en lips and throat, and if any considerable amount be swal-
l, hives will develop in less than an hour. (Anaphylaxis.) In
in cases of suspected poisoning it is wise to administer an emetic;
l cases it is better to give a purge. A saline laxative is best, as
; quickest, but it is well to follow this by some thorough cleansing
, as castor oil. Then the intestines require critical and deliber-
tention. Diuretics are often of use. The alkaline mineral waters
arious sorts of eliminants are often employed. Pilocarpin by
h or under the skin is of value. Quinin is admitted by all to be
ful remedy, for known or unknown reasons. Arsenic is often
vice when all other remedies fail. Codein is an excellent quieting
. Externally, alkaline baths are of great comfort, followed by
ing powders. Vinegar and water, alcohol and water, and car-
acid and glycerin lotions relieve. Chloroform, a dram to the
: of alcohol; ammonia and water, especially bran water, each
their sphere. In the subacute or chronic forms ointments act
ly. (See the treatment for Eczema.)

CHAPTER XXI

DISEASES OF THE EAR

The more common diseases of the ear occurring in childhood will be described, and, for the better convenience of the busy practitioner, only such treatment as has proved most efficient in our hands will be given. The diseases requiring instruments of precision for their diagnosis and belonging essentially to the expert will not be dealt with.

Before considering the various forms of affections of the ear it may be well to recall a few facts of special interest in the anatomy of the ear in early life. The ear of the child, like that of the adult, is divided into—(1) The sound-conducting apparatus, which includes (*a*) the external ear, auricle and external meatus; (*b*) the middle ear (the tympanic cavity, with membrana tympani and ossicula), the Eustachian tube and the cup-shaped cavity which is the precursor of the mastoid cells. (2) The sound-perceiving apparatus—the internal ear or labyrinth. After all, the middle ear is a sinus of the naso-pharynx. (Makuen.)

The external meatus of the infant is nearly as deep as that of the adult. Absence of the bony canal at this stage is compensated by the presence of the fibrous membrane in which the bone is formed later. The caliber of the meatus is smaller in infancy and more apt to be prolapsed, while its direction in the very young is often at first downward instead of upward. It is therefore often necessary, in order to obtain a good view of the fundus, to draw the auricle downward and outward, and not upward and backward as is the case in the adult ear or in that of later childhood. It may be well also to remember that the dropping of the lower jaw will sometimes enlarge the meatus.

The lining of the middle ear is continuous, through the Eustachian tube, with that of the nasopharynx, and therefore diseases of the vault of the pharynx, whether primary or secondary, are apt to be accompanied by ear symptoms. After all, the middle ear is a sinus of the nasopharynx (Makuen). Among the anatomic factors which make diseases of the middle ear an especial menace in childhood is the suture (*sutura petroso squamosa*) which is found in the roof of the middle ear at this age, and which sometimes amounts to a deficiency which per-

sists throughout life. In the new-born infant processes of connective tissue from the dura containing blood-vessels pass through this suture into the tympanic cavity. It may thus be readily seen how a hyperemia of the tympanic mucous membrane might promptly spread to the dura and cause the meningeal irritation which is so often met with in middle-ear diseases in children. The fetal tympanic cavity is filled with a gelatinous mass, some of which persists partially degenerated after birth as a yellowish-green, thick fluid containing fat and pus-corpuscles, which are usually absorbed a few weeks after birth, but which at times causes an inflammation of the tympanum and leads to the perforation of Shrapnell's membrane, which has been named the foramen of Rivinus. The lining of the tympanum in the new-born infant is remarkable for the abundance of its vessels and its general tumefaction. The mastoid antrum is the only one of the air-spaces present in the new-born.

The ears of children should be carefully examined during the progress of the exanthemata and infectious diseases, and in cases of fever where the diagnosis is doubtful, on account of the liability of throat affections to spread through the Eustachian tube to the middle ear. In these cases the onset of the disease is apt to be insidious, and unless looked for, may not be discovered until it has gone so far as to cause permanent disability. The habit of treating lightly the affections of the ear in childhood is to be deprecated. The importance of their early diagnosis and prompt treatment is realized when we consider that fully two-thirds of the ear cases which present themselves for treatment in adult life originate in childhood, and a large proportion of them might have been cleared up by a few simple treatments in their early stages.

Many people, including all classes and conditions, are apt to treat the ear diseases of childhood lightly, an idea which is encouraged by some physicians. Death has occurred in such cases from meningitis when the seriousness of the ear trouble was entirely unsuspected. Among the diseases which show a special predilection for ear involvement are scarlet fever, measles, diphtheria, typhoid fever, influenza, and syphilis.

The only instruments required for an examination of the fundus are a head mirror, a strong light, a delicate cotton-tipped probe, and possibly a speculum.

The ear troubles which occur in childhood may be classified as: I. Diseases of the external ear. II. Diseases of the middle ear. III. Diseases of the internal ear.

I. DISEASES OF THE EXTERNAL EAR

The diseases of the skin which occur in the external ear may be of almost any variety and should be treated by the same means which are used in similar diseases occurring elsewhere.

Eczema of the auricle and vicinity is the most common of the skin diseases met with in this locality. It is most often caused by excoriating discharges from the middle ear, and will usually promptly yield to treatment after removal of the cause.

Treatment.—In obstinate chronic cases the crust should be carefully removed and the surface cleaned prior to the application of healing remedies. For this purpose green or Castile soap and water or, better, peroxid of hydrogen may be used to soak the scab, after which it can be readily removed; then the surface may be dried by a solution of nitrate of silver (sixty grains to the ounce of water), after which an ointment of the yellow oxid of mercury (two grains to the dram of petrolatum) should be carefully rubbed into the excoriated surface. In certain cases, after the cleaning process, calomel ointment, twenty grains to one ounce of petrolatum, or an ointment of zinc oxid, preceded by black wash, or ichthyol ointment, 25 per cent., may be successfully used, but most cases yield sooner or later to the treatment first outlined. Most of these cases of eczema are essentially local in character, but in some of them cod-liver oil, hypophosphites, etc., may prove beneficial and, in the non-inflammatory type, arsenic may be indicated.

Furuncles or **boils** occur less frequently in children than in adults. The exciting causes are probably the staphylococcus pyogenes aureus and albus, which penetrate the hair follicles, and which are introduced by mechanical irritants, foreign bodies, the instillations of irritating substances, and the like. They frequently occur in one otherwise in apparently good health. They are usually situated near the orifice of the external meatus, in the cartilaginous portion. Their most prominent symptom is pain, which is most intense when they are deep seated, radiating over the whole side of the head and neck. When not deep seated, swelling may usually be easily detected by the aid of a reflected light. This is at times red or livid, and is very painful to the touch of the cotton-tipped probe. If deep seated, the pain is more marked, the swelling less so, and there is usually no change of color. Their location, however, may be determined by the aid of the probe. If anteriorly located, the region in front of the tragus may be swollen and tender, and when posteriorly located, they may simulate mastoid swelling and pain. Two conditions which resemble furuncles

arance are: (1) Exostoses, when covered by a red skin; (2) caused by burrowing pus from the mastoid or tympanum.

tment.—The severe pain of furuncles is most promptly relieved ep incision through the tender area, which should be done rict asepsis. The release of the tension consequent to the tting will usually bring relief, even if no pus be liberated. cision should be anointed with the official ointment of the xid of mercury, which should be gently forced into the wound. the furuncle be pointed, a small prick will probably bring ithout the prick itself causing any pain, or the "carbolic stick" used. The incision should be made under strong illumination, ict asepsis, and preferably with a small knife made for this pur- If the pain is not excessive, hot boric solution may be gently l into the ear or allowed to flow in from a fountain syringe at a levation or from a teapot. Hot-water bags or hot salt- or hop- ten give relief, after careful cleansing and the application of an t of ichthyol or the yellow oxid of mercury. So, also, hot car- oil or carbolized glycerin is at times grateful. The use of il and laudanum, hot raisins, tobacco-juice, and what not the whole gamut of "household remedies" should be dis- d. Furuncles often occur in series of three or four, and it is forewarn those interested of this fact. If this tendency is t, bacterin therapy should be employed.

minosis.—Excess of cerumen or wax banked up in the meatus may be caused by: (1) frequent hyperemias of this (2) contraction of the meatus; (3) improper cleaning of the meatus by inserting the twisted corner of a wash-rag or similar contrivance into the ear.

nts and nurses should be especially warned against mechan- ritating the lining of the canal by undue cleanliness, and it be pointed out to them that if the concha be wiped out with a ist rag, the canal will take care of itself, and that anything ed into the meatus is likely to do harm and result in anything desired cleanliness. These plugs of epithelium and wax may and yellowish, or hard and dark brown. They can be readily l by the aid of reflected light, and may be safely and promptly l by syringing with hot water.

tment.—The canal should be straightened and opened by on the auricle, and a stream of hot water from a syringe should cted around the edge of the plug parallel to the direction of l and chiefly along the upper wall. A few syringefuls carefully

directed will bring out the plug without further manipulation. Should the mass be too hard, however, it may be softened by a few drops of water and bicarbonate of soda, added at intervals for twenty-four hours, after which it may easily be removed by syringing. Instruments should not be used forcibly for the removal of wax. The wax plug itself is practically innocuous, while clumsy instrumentation will bring about grave disturbances. After the removal of the wax the canal should be gently wiped out with cotton soaked in equal parts of peroxid of hydrogen and alcohol, then loosely plugged with aseptic cotton, and the directions given that it should be removed at bedtime and left out.

Foreign Bodies in the Ear.—These may be of any kind or shape, and may readily be detected by the use of strong reflected light. The symptoms are not usually serious, even when the foreign substance is allowed to remain in the ear over long periods of time. Cases have been reported in which beads, grains of wheat, and like substances have remained in the ear for forty to forty-five years only to be discovered by chance at the end of that time. Rarely insects gain access to the canal, or actually implant their larvæ there. This point should be especially borne in mind, as it is better to allow the foreign body to remain in the ear than to use severe measures for its extraction.

Treatment.—The size and shape of the foreign body, as well as its location, should be noted by the aid of reflected light; then, with a carefully directed stream of tepid water or boric-acid solution, the body may be forced out of the canal. The syringe nozzle should be long and narrow, so that the course of the stream may be accurately followed by the eye, and it should be so directed that it will pass the body, which will then be forced out by its return flow. This failing in the hands of one unskilled in ear manipulation, it would be well to refer the case to an expert. Clumsy manipulations of foreign bodies have brought about most disastrous results.

II. DISEASES OF THE MIDDLE EAR

The majority of diseases of the ear occurring in childhood come under this heading, and they may be intelligently studied under four divisions—namely: (1) Acute inflammation of the middle ear; (2) acute suppurative inflammation of the middle ear; (3) chronic suppurative inflammation of the middle ear; (4) chronic catarrhal (sclerotic) inflammation of the middle ear.

1. **Acute inflammation of the middle ear (otitis media acuta)** and acute suppurative inflammation of the middle ear resemble each

other up to a certain point in etiology, symptoms, course, and treatment. They may, therefore, be considered together. Each may be defined as an acute inflammation of the lining membrane of the middle ear, caused by undue exposure, inflammation of the nasopharynx, foreign bodies, or other traumatisms. It may at times be superimposed upon a chronic middle-ear catarrh. Both the simple and suppurative forms are more common in children than in adults. Usually but one ear is affected at a time, although in cases of scarlatina or typhoid fever both ears are often affected. The two forms resemble each other up to the point of perforation of the membrana tympani, which determines the suppurative condition. In the suppurative condition, however, the symptoms are apt to be more aggravated. Scarlet fever is a most fertile source of middle-ear inflammation. Twenty per cent. of all chronic diseases of the middle ear originate in this disease. The onset of the ear trouble in scarlet fever is often insidious, and unless the ear is examined, even when there are no symptoms present, its course may be partly run and irreparable damage done before detection. It is interesting to note in this connection that the ear symptoms in scarlet fever are closely associated with the nephritis, and it has been held that the early cure of the kidney condition has a happy effect on the course of the ear trouble, and vice versa. Special examination of the ear should be made from time to time as a routine procedure in scarlet fever; odor and discharge should be carefully looked for so that the danger of infection of the meninges may be guarded against. The ear is less frequently affected in measles than in scarlatina. Here, again, the ear trouble is the result of extension of the inflammation from the throat through the Eustachian tube. In measles the otitis is apt to be of milder form than in scarlet fever, but it should, nevertheless, be carefully looked to. In hereditary syphilis inflammation may spread through the Eustachian tube to the middle ear. In rheumatoid arthritis ankylosis of the ossicula may rarely occur in childhood, while in Hodgkin's disease deafness may occur from occlusion of the Eustachian orifices by adenoid enlargement. Ear diseases may be early manifested in leukemia.

Symptoms.—There may be no early symptoms or there may be a stinging, throbbing pain extending at times over the head to the teeth, usually intermitting and worse at night. In children there is frequently a tenderness over the whole external region of the ear, more especially over the region of the Eustachian tube in the neck. In the very young ear pains are frequently indicated by the patient putting the hand to the affected ear, or leaning toward the affected side; also by

restlessness and irritability. There may or may not be fever in the suppurative form there is apt to be a rise of temperatur children may complain of noises or numbness in the head ar culty in hearing. Examination of the fundus in this conditio the membrana tympani more or less injected, especially in th the short process and manubrium.

2. **Acute Suppurative Inflammation of the Middle Ea** more severe forms (suppurative forms), which lead to perfo entire membrana tympani is injected as well as the osseous r that it is difficult to tell the membrana tympani from the w canal, as the boundaries are no longer well defined and the p lost, while the cartilaginous meatus is often painfully swollen, the external parts and the neighboring glands. A perforat present, is difficult to be seen even by the expert. Howeve ence may be recognized by the discharge and cessation of pain. The results of middle-ear inflammation are: (*a*) (*b*) transition to the chronic form; (*c*) progression to the su form, mastoiditis, meningitis, or sinus thrombosis.

Prognosis.—Generally favorable, except in the infectiou in weaklings.

Treatment.—This should first be directed to the nasop condition. The nasopharynx should be thoroughly sprayed alkaline antiseptic solution. The Politzer bag tip should applied to one nostril, and the bag forcibly compressed so as t remaining secretions out of the opposite nostril. The na should then be wiped with a curved cotton-tipped applicator, been previously dipped in boroglycerid or dilute glycerol of ta introduced through the mouth back of the soft palate. T chian orifices should receive special attention in this cleansin The Politzer bag tip should then be applied to one nostril, firmly compressed, and the vapor of chloroform or iodin heated air from above a lamp should be gently forced into t ear. In order to maintain sufficient pressure in the nasop successfully Politzerize the tympanum, the soft palate should against the posterior pharyngeal wall, to accomplish which t should be told to puff out the cheeks or swallow a sip of water is used, the bag should be compressed at the moment th Adami rises. The act of crying will also serve to raise the s During the early stages this line of treatment will often im relieve earaches as well as deafness. This failing, a hot-w should be applied to the ear or a hot douche of water or boric-

tion, long continued, may be used with gentleness. A 2 per cent. solution of carbolic acid in glycerine may give much relief. The internal administration of hexamethylenamia may yield good results. The various household remedies so often indulged in should be adjured. They embrace poultices, onion-cores, sweet oil, hot raisins, laudanum, the painting of the mastoid with tincture of iodin, or even blistering it. Poultices tend to increase the congestion; onions are surgically unclean; iodin and blistering disguise mastoid complications which may arise later. If the symptoms are severe, indicating that we have to deal with the suppurative form, a paracentesis will give relief when there is bulging of the membrane. This little operation should be done under strict asepsis and strong illumination. The most prominent point should be incised, care being taken to avoid the ossicles and due account being taken of the obliquity of the tympanic membrane. Injuries of the promontory are not apt to retard the healing process. The incision should be followed with inflation by the Politzer bag, as described above, and a hot douche, or syringing with hot water or boric-acid solution, after which the canal should be dried and protected with aseptic cotton. Daily cleansing and Politzerizing should follow until suppuration ceases. Due attention should be paid to the general condition, and the indications met as in ordinary cases. The patient should be kept in a recumbent position. Should the mastoid region become puffy, boggy, red, and tender, with intermitting fever, and especially if these symptoms are accompanied with puffiness of the superior, posterior, inner wall of the meatus, opening of the mastoid is indicated. Sudden cessation of the discharge with a drop of temperature and slowing of the pulse imply that the pus has made into the cranial cavity.

3. **Chronic suppurative inflammation of the middle ear** may be defined as a suppurative condition of the middle ear occurring most frequently in childhood, and involving the tympanic membrane and often the external meatus, the bony walls of the middle ear, or even the labyrinth.

Etiology.—The more common cause is the progression of the acute purulent otitis of childhood, especially that following scarlet fever, diphtheria, typhoid fever, and other infectious exanthematous diseases. It is frequently bilateral. It may at times develop in certain cachexiæ without the previous acute phenomena.

Symptoms and Results.—These are most various and complicated. It will be sufficient for our purpose to state these in a general way only, leaving the details to text-books devoted especially to diseases of the

ear. In the very young attention is frequently first called to this disease by the discharge from the meatus or by the odor. Headaches or fullnes in the head may be present, or more rarely giddiness or vomiting disturbances of hearing, in varying degrees, are usually present, an should there be damming up of the pus, pain is also experienced. Th results of this disease are: (1) Hypetrophy of the mucous membran (2) hyperplasia in the form of granulations or polypi in the tympar cavity; (3) connective-tissue formation leading to adhesion betwe the ossicula, membrana tympani, and walls of the tympanum; destruction of the mucous membrane, membrana tympani, and, oft of the bony parts. The tympanic membrane is almost always p forated and it may be thickened. The perforation may be of a degree or shape. There may be caries or necrosis of the temporal bo or the formation of osteophytes. The secretion may vary in charac and quantity, and the presence or absence of odor is not signi cant except as indicating the retention of secretion. There ma be changes in the secretion of cerumen or cholesteatomata may formed.

Treatment.—While the treatment varies according to the charact and extent of the destruction of the parts, it may be outlined in a gener way. As in the acute form, the nasopharynx should be cleansed a the tube-mouths wiped out; then the ear should be gently wiped a dried by a tuft of aseptic cotton on a delicate applicator, following whi a similar tuft dipped in peroxid of hydrogen may be gently wiped o the surface to boil loose particles of dry mucopus, epithelial scal bony detritus, and so forth. The middle ear should be Politzerized clear the Eustachian tube, and again wiped clean. If there is tun faction of the mucous membrane, a solution of alcohol (50 per cent. first, gradually increased to 95 per cent.) may be applied to it, and th again one should Politzerize, wipe dry, and dust with a small amount boric acid by means of an insufflator. If these cases prove obstina aqueous solutions of silver nitrate (sixty grains to the ounce) may substituted for the alcohol solution, or a solution of sulphate of z (4 per cent.), or a solution composed of alum (one dram), zinc sulph (one dram), carbolic acid (forty grains), water (two ounces). polypi are present, they should be snared, or they may be reduced alcohol or chromic acid applications. Caries may indicate curetm or the removal of the ossicles, or even one of the various mastoid ope tions. At times the cleansing process may be aided by the use o rarefacteur to draw the pus into the external meatus, or the Eustachi catheter may be needed the more forcibly to clear the tube or to gui

various fluids—*e.g.*, boric acid solution (4 per cent.) and warm saline solution—through it. Aristol, iodoform, acetanilid, or their modifications may be substituted for the boric powder. These cases should be cleansed every other day at first, and then, as they improve, twice weekly, once weekly, and so on, gradually increasing the intervals between treatments as recovery progresses. Internal treatment is indicated in rheumatism, syphilis, anemia, and other general diseases. Cholesteatomatous masses may be removed by means of the curet or attic syringe, or may require a mastoid operation.

4. **Chronic Catarrhal (Adhesive) Inflammation of the Middle Ear.**—This name has been given to those inflammations of the middle ear which give rise to sclerotic (adhesive) changes in its lining mucous membrane and lead to permanent defects of hearing. The condition may start in an exudative catarrh, or it may start insidiously as an interstitial inflammation which is progressive. The condition, after running an insidious course, usually ends in extreme hardness of hearing. Fortunately, this disease is not frequent in children, although its occurrence in after life may be precluded by the careful and timely treatment of the exudative forms of middle-ear trouble.

Etiology.—(1) Chronic nasopharyngeal catarrh; (2) postdiphtheric paralysis; (3) scrofula, tuberculosis, marasmus, or anemia.

Pathology.—The pathologic changes consist in the formation of fibrous connective tissue in the mucous membrane, with shrinking (sclerosis), atrophy, and calcification of the newly formed tissue. Thus, the ossicles are bound to each other and to the walls of the tympanic cavity. The tympanic membrane may appear normal, may be thickened or atrophied, or may have chalk deposits within it. The symptoms to be looked for in children are progressive deafness, subjective noises, which latter, however, rarely annoy them, even when present, and there may be *mental dullness*, which may be the most prominent symptom.

Treatment.—Hygienic conditions should be carefully attended to, wet feet guarded against, as well as sudden cooling of the body, and cold sleeping-rooms should be avoided. The nose and nasopharynx should be placed in approximately normal condition by the removal of deformities, polypi, etc. Politzer's method or the catheter should be used to inject air, chloroform vapor, iodin vapor, or various solutions (?) into the middle ear. Gentle aural massage by means of Siegle's or Delstanche's apparatus is often indicated. The use of the Valsalva method is not advised, although automassage by pressing the finger to the tragus may be encouraged.

CHAPTER XXII

CONDITIONS REQUIRING SURGICAL PROCEDURES

LYMPHADENITIS

Synonym.—LYMPHANGITIS

Inflammations of the lymphatic glands are of great clinical importance and not very simply classified as yet; they may be acute, chronic, or tuberculous.

These glands are so situated that they act as sentinels to the circulatory system, and, being endowed with bactericidal power, they have the power of destroying or neutralizing poisons, and it is only by the overwhelming numbers of bacteria being absorbed that they themselves become affected, for, according to recent investigations, inflammation of the lymphatic glands is caused by the absorption of some form of bacteria or toxin, invariably from a more or less distant focus—that is, from without. The axillary, inguinal, cervical, bronchial, and mediastinal glands are the ones most frequently affected.

ACUTE LYMPHADENITIS

Definition.—Acute inflammation of the lymphatic glands.

Etiology.—The most common causes of inflammation of the glands are the eruptive and infectious diseases, as scarlet fever, diphtheria, adenoids, inflammed tonsils, and septic wounds, diseases of the teeth, ear, etc. The face and neck, being largely exposed to slight traumatism and protected by a thin epithelium, furnish a fertile infection atrium.

Pathology.—A lymph-node is the first filtration station against the invading micro-organisms, and in many instances it is altogether, or again only in part, able to repel the attack. Failing in this, a chain of glands becomes infected. The degree of damage is in proportion to and is modified by, the inherent resisting power of the individual. In acute inflammation the gland becomes intensely vascular, with free exudation; the escaping leukocytes there, as well as those in the lymph coming from the primary focus, are retained and accumulate in the gland until it is impossible to recognize the cortex from the medulla.

form, then curetment is necessary. If this proves unsuccessful, it should be laid open.

Chronic Adenitis

Chronic adenitis may follow the acute form, or the disease may be chronic from the beginning, and while it is not necessarily tuberculous, in the large majority of cases it becomes so.

Etiology.—Simple chronic adenitis begins, like the simple acute form, in some point of infective invasion from without, such as adenoids, enlarged tonsils, chronic skin troubles, ingrown toe-nails, caries of the teeth, producing inflammation at or around the roots. The infective material may remain dormant in a gland after the disease process at the point of invasion has been cured, and yet from some slight cause the poisons may again become active.

Pathology.—In simple chronic adenitis the reticular structure becomes thicker and more fibrous, the lymph-cells diminish in number, the gland becoming hard and fibrous. In the first stages of a tuberculous gland, as a rule, it is redder than usual, though sometimes it may be gray and somewhat translucent.

The tuberculous granules are made up from the vascular and lymphatic vessels found in the cortical and medullary portions of the gland. Caseation rapidly develops in them, and is due to vascular obliteration.

When caseation is established, almost all of the bacilli have disappeared, but the spores remain, which are capable of reproducing the disease. The presence of the bacilli is rarely demonstrable in the product of the glands, but when guinea-pigs are inoculated with the pus, they readily become affected with tuberculosis. Tuberculous adenitis may be a local disease, undergoing spontaneous resolution, but so long as the focus is present it constitutes a menace to the system.

Symptoms.—Swelling, which may develop gradually or remain from an acute attack, no pain, no redness of skin, movable, but may in time, through peri-adenitis, become glued to the skin, especially if more than one gland is affected.

The symptoms may be divided into three stages: First, that of induration or indolence; second, that of inflammation; third, that of suppuration.

The first stage may last for years; the glands are hard and elastic. In the second stage they take on activity, becoming painful and tender, with more or less redness of the skin. In the third stage the gland

softens, the skin ulcerates through, and the contents of the gla caseous matter mixed with a whitish, watery fluid, is evacuated resulting cicatrices are adherent, depressed, and very disfig The low grade of inflammation of chronic adenitis forms a goo in which the tubercular bacilli may grow. Certain observers and adduce strong testimony to prove that when enlarged glar children persist and finally pulmonary tuberculosis occurs, the tion is conveyed from the glands to the lungs, the pulmonary t being secondary to that of the glands. Seventy or eighty per c

FIG. 108.—TUBERCULOUS NECROSIS OF THE JAW. A sinus is also present b the left eye. A patient of Dr. Reber.—(*Samaritan Hospital.*)

enlarged cervical glands may be said to be tuberculous. The c tracheal, bronchial and mesenteric glands are most frequently a in children, but in acute conditions, such as the infectious they become more widely involved.

Diagnosis.—Chronic adenitis invariably arises from some d point of entrance, some lesion, such as chronic skin troubles, ton ulcers, etc., one or two glands only being affected. In tubercular a usually the entire lymphatic system is more or less affected. syphilitic adenitis the simple forms can be differentiated by the h of a primary sore, etc., rarely seen, however, in childhood. The sermann reaction may settle the question.

In lymphadenoma the tumor is larger and does not suppurate n lymphosarcoma there is longer duration and a much larger size o umor before it breaks down. Polyadenitis in children is said to be a liagnostic sign of tuberculosis. Hodgkin's disease and lymphatic eukemia must be differentiated by the characteristic symptoms, nemia, dyspnea, etc. The tuberculin tests are clearly indicated and vill almost certainly make the diagnosis clear. Tuberculous necrosis f the jaw may simulate tuberculous adenitis. (See Fig. 108, p. 978.)

Prognosis.—Chronic adenitis may end in resolution or in suppuraon. The pus may burrow around large vessels, and so weaken their alls as to produce fatal hemorrhage. If the gland should be tubercuus, there is always danger of general infection.

Treatment.—Specific treatment with tuberculin has yielded endid results. We follow the method of Trudeau, using O. T. : start with 1/10,000 of a milligram; give two injections a week, and ible the dosage of the previous injection every time until the subt has had a thorough course (six weeks to three months). We strive void "reactions"; but if such should occur, we recede to the previous age and do not ascend. The constitutional treatment of chronic nitis is most important, good food, hygiene, and plenty of fresh air ng prime factors in the restoration. As to drugs, we rely principally reconstructive agencies, iron, arsenic, oils, and nucleo-albumins. en possible, a change of climate should be prescribed, especially in erculous cases. The good results obtained in tuberculous cases n high altitude and dry climate, like that of Colorado, is at times rvelous, and when possible, it should be taken advantage of, while -bathing is very beneficial and should be recommended in such es.

Local Treatment.—Resolvents are indicated, such as an ointment iodin and iodid of potash, or an ointment of ichthyol or ichthyol and rcury, gently rubbed in at night. The interglandular injection of o minims of a 10 per cent. solution of chlorid of zinc once a week, or ee minims of equal parts of carbolic acid and glycerin, is said to cite the growth of a new fibrous tissue which encapsulates the dissed portion. In twenty-three cases reported by Lannelongue, in ich he used the chlorid of zinc solution, fibrous encapsulation ocrred in every case. Local treatment by the X-ray is sometimes of gnal service. Extirpation of the gland is strongly recommended some of the best surgeons, but we must never lose sight of the fact at in removing the entire mass of glands of one region we remove e valuable sentinels, or guards, but so long as these canals are severed

they can no longer act as avenues of invasion to bacteria. It would, therefore, be better to leave total extirpation as a last resort. If the gland should suppurate, incision, curetting, and packing with iodoform gauze are indicated. To sum up the treatment: first, through constitutional and local remedies, backed by climatic environment. If possible, endeavor to secure resolution, leaving total extirpation as a last resort; if, however, the glands involved should be few and there is a strong suspicion of their being tubercular, it is best to remove them at once. Should the glands suppurate, proceed to incision, curetting, and packing.

INJURIES AND SHOCK

Children bear injury badly, and in them shock is most marked. A slight loss of blood in a child frequently causes serious prostration but the recovery is equally prompt and complete.

A description of the most serious injuries will be found in works upon general surgery and upon the special surgery of childhood, and it is therefore unnecessary to attempt to give a list or an account of them here.

Burns.—Burns from fire, acids, lime, and other corrosive agencies as well as scalds from hot water, tea, soup, or, indeed, whatever cause are best treated at first by a normal salt solution, sterile, or a strong solution of bicarbonate of soda. For soothing qualities the application of the oleaginous preparations are not particularly clean, but more comforting, such as boric ointment, carron oil, etc. This may be put on over the injured part, which is then enveloped in sterile absorbent cotton and placed at rest. Picric acid is very valuable in the case of small burns. If the destruction is more than superficial, ulcers will form which must be treated upon general antiseptic principles. Here the bichlorid solution cannot be safely used, at least not constantly.

Children bear all forms of chemic antiseptics badly, and they frequently retard, if not entirely prevent, wounds from healing. Dry powders of a simple character, such as bismuth, oxid of zinc, and, if the area upon which treatment is to be directed is not large, iodoform are better than many of the stronger germicides.

In the healing of burns and scalds cicatricial contractions of the skin and deeper tissues are to be expected unless great care is exercised in keeping the limbs extended. Simple splints or weights and pulleys if the contraction is of the lower extremities, will often prevent a very considerable amount of deformity. If, however, these simple measures are not efficient after thorough and persistent trial, skin-grafting

after the contracting bands are divided, should be used to close the wounds.

Shock.—The treatment of shock is to put the child at once to bed; surround it with hot-water bottles or hot-water bags, but be certain that they are protected so as not to burn the skin; give rectal injection of one or two ounces of black coffee and hot salt solution of a strength of one dram to the pint, and small doses of atropine hypodermically. If no attempt at reaction follows this and the injuries are not of such a character as to prohibit the child's being moved, a hot bath is of very great service. Drugs and stimulants given by the mouth, unless there is some effort at reaction, are of very little service, because with children, even more than with adults, the shock absolutely arrests digestion and absorption from the stomach, and there is danger of filling the stomach with stimulants which, when reaction does set in, will become suddenly absorbed and cause the patient to be overwhelmed by their accumulated action. Epinephrin in sterile salt solution has been employed intravenously.

HARELIP.—CLEFT PALATE

Harelip may be single or double. It may involve simply the lip or be associated with cleft palate. Both are due to faulty development of the fetus.

Children marked with this deformity are usually unable to nurse from the breast, as the power of suction is lost, and require the greatest care in their management. The harelip must be operated upon early—a few days after birth, if possible—leaving to a later age—from three to six weeks—attempts to close the cleft palate.

The closure of the cleft palate is best done at two sittings, if the cleft is extensive. The first operation should be upon the hard palate; in a few months the cleft in the soft palate should be repaired.

It may be necessary to resort to the forced feeding of the child by means of a soft-rubber catheter and syringe. A specially constructed nipple with a shield to fit over the cleft in the palate sometimes answers in very young infants. These children are always of low vitality, and, in spite of all efforts, may die very early.

DISEASES OF THE JOINTS

Diseases of the joints are acute and chronic. The acute inflammations, synovitis and arthritis, are produced, first, by injury; second, by rheumatism; third, they occur in acute infectious processes, as in the case of scarlet fever and measles.

The acute arthritis of infants which we see occasionally after the eruptive fevers is an acute septic process, with very rapid destruction of the joint and the surrounding tissues. The correct diagnosis of the character of the lesion is imperative, and if suppuration occurs, active surgical interference is needed to drain the joint and prevent further destructive changes.

Inflamed conditions of the joint following injuries are treated on general surgical principles: by absolute rest and splint, with hot or cold applications, the time-honored remedy, lead-water and laudanum, being of comparatively little value.

In acute stages ichthyol and lanolin, 12.5 to 25 per cent., rubbed into the joint after the heat is applied, is frequently of great benefit. The most essential point, however, is rest. If the joint is very much distended, either by blood or articular fluid, it may be well to aspirate but only under the very strictest antiseptic precautions. The products of inflammation in the joint must be removed, or they will lead to the formation of adhesions and frequently destroy the usefulness of the joint.

By far the most common cause of joint disease in children, and indeed, of diseases of the bone as well, is tuberculosis. The ankle, knee, hip, spine, in fact any or all of the articulations of the body, may be infected.

Tubercular diseases of the joints should be treated by conservative methods. Sea-air has also proved of inestimable service in these cases. Tuberculin treatment here plays a remarkable rôle (See treatment of chronic adenitis.) Absolute rest in plaster-of-Paris and some form of splint apparatus, and injections of iodoform and glycerin may be tried. The method of passive hyperemia, as used in Germany, and which consists in constriction both above and below the joint with rubber bands, the restriction being only sufficient to cause venous engorgement without completely cutting off the venous circulation, may be cautiously tried. This will require care and watchfulness and a long interval of time, but the results, in many instances, are undoubtedly beneficial. When, however, the destructive process has advanced to such an extent that the joint is totally destroyed, and when the tubercular infection is very profound and the pain acute and persistent, so that the child's bodily health is rapidly failing, arthrectomy, or excision of the joint, should be done.

Bear in mind that arthrectomy, or excision, will only give, at best, a mutilated limb, but it will often be demanded as a life-saving measure on account of the rapid progress of the disease.

Complications are abscesses, which are not true abscesses from a bacteriologic standpoint; they are formed by the breaking-down of tubercular deposits, and are called abscesses, though they do not contain the germs of suppuration; they are made up of chessy masses of broken-down tissue which are loaded with tubercle bacilli. When such abscesses form, if after a reasonable time absorption has not occurred, they should be freely opened, so that the whole interior may be evacuated.[1] The granulation tissue, which will be found covered with tubercular deposits, should be curetted, first with a sharp spoon and then with a dull spoon, or gauze and sponges may be used. All the time a constant flow of distilled water should be employed to wash out the wound, every particle of the material being scraped away. The wound is then to be closed, without drainage, after a small amount of iodoform has been dusted into it. This method of treatment, however, is only of use when the greatest care has been exercised to perfect the antiseptic technic, for if this is not the case, the wound may become infected by pyogenic bacteria—a double infection will be present, and much more serious results ensue than if the abscess were allowed to break of itself.

Many surgeons of wide experience in this class of cases totally oppose any surgical interference whatever, claiming that in a vast majority of cases the ultimate result will be better if the opening occurs spontaneously and the discharge of the diseased tissues is left to nature than if the abscess be artificially emptied, and that the danger of mixed infection is very greatly reduced; also the resulting scar is smaller when the abscess is allowed to open spontaneously. This is totally opposed to the authors' own personal experience, but it is the view held by a very large number of orthopedic surgeons.

Tubercular arthritis or white swelling of the knee, is one of the most common diseases of the joints in children. Next, **hip-joint disease, ankle-joint disease,** and **Pott's disease** of the spine, or spondylitis, occur most frequently. In all these cases the most important element of treatment is absolute rest of the joint, at first by confinement to bed and the bed-frame; next, by good food and good hygienic surroundings, fresh air, bright sunlight, and, lastly, by a perfectly fitting splint or brace.

[1] We have become opposed to all operative measures in these cases. Abscesses should be prevented by rest, immobilization, open air, free feeding and tuberculin. If they have already formed aspiration and injection represent procedures of choice.

APPENDIX

BY JOHN MADISON TAYLOR

DEVELOPMENT. ANOMALIES OF DEVELOPMENT. CONSERVATION. DEFORMITIES OF INFANTS AND CHILDREN

THE CHILD AS A CLINICAL PROBLEM

General Remarks on Infants and Children in and out of Health

I

Unless the foundations of organic integrity are laid aright, the child fails to become a useful or happy citizen. Happiness, usefulness, the capacity for assuming responsibilities, depend on right direction of energies in earliest years of growth.

An infant fed from its mother's breast receives not only the largest measure of physical invigoration, powerful defenses against any form or kind of acute disease, the strongest autoprotective and reparative forces; but also a measure of moral power obtainable in no other way. Any chemical substitution, however perfect, is not to be compared in efficacy to the dynamics conferred by mother-love, through the small maternal sacrifices, or rather privileges, of breast-feeding. No infant can become adequately fortified against perils to mind and body who has not enjoyed the inestimable advantage of maternal care and training. The first few months of life are those in which the individual may be made or marred, hence the imperative need then for fullest conservation.

However vigorous, well-endowed or seemingly perfect one may appear who, for reasons good or bad, has been denied the personal care of a mother in earlier months or years, there is achieved little more than half the potentialities of which one is capable. The other half is lost somewhere. The whole should be conserved.

The infant is too often regarded as a small adult, a man or woman in miniature. It is nothing of the sort. We must remember the young human being is by long odds the most dependent on good care, and for a longer period than any other animal. Among the reasons for this is one seldom mentioned or realized, viz., embryologic features persist for years and only emerge through the slow organic processes with safety, and to perfectness, in favorable conditions of environment. This subject of persistence of embryologic characters

in infant development is only beginning to receive due attent
child-study grows, much will appear to guide the specialist
atrics, in psychology, in eugenics; data will be furnished fro
rules can be deduced controlling growth—undersize, over-siz
tions or defects of organic integrity.

II

The clinical problems of childhood are far more comp
those of adults, if the domain of psychopathy be exclude
key to success in conservation lies in acquiring an intelligent a
tion of the intricacies of infantile, childish and adolescent a
growth, change, derangement, and capabilities for repair.
can be worthier the best efforts of clinicians than to achiev
in recognizing and correcting childish developmental anom
ailments. Errors and omissions in combating primary morb
in them impair for all time constitutional integrity. Indic
departure from the norm cannot be neglected, condoned or
as can similar abnormalities or perversions assailing the adult

The child is a vitalized mechanism of indescribable deli
disorders are neglected or pass unchecked into disease, the d
effects are both direct on structure, and indirect on deve
bearing heavily upon conformation, on susceptibilities, c
organs, checking growth in the brain and controlling centers.
tion given to the earliest recognition and correction of chi
abnormalities, arrests and maladies, therefore, cannot be too
encouraged.

The cells of the child are in process of almost primitive e
Selective affinity is not yet developed; resistance is low, irr
conductivity and other inherent physiologic properties are
Resistance is so small that even a slight excess, or prolon
tinuance of an irritant, whether it be photic, thermic, chemic,
other, may produce violent perturbations, and readily ca
alterations in cellular integrity as to induce profound an
damage. The balance of the vasomotor mechanisms in th
has not yet been developed to a degree which enables them t
safely the effects of overmuch interference. The cerebrospin
respond so swiftly to irritants that reflex potentials may readily
overwhelming. Hence, for example, convulsions follow
slight causes.

The elemental principles by which we can be guided in cc
the disorders in growth or function of infants and children s

thoughtfully formulated by each one for daily use. We can then at least determine the form and direction which these deviations from normal functionation will probably take, and outline safe measures by which they can be modified or overcome.

III

The keynote of pediatric conservation is the encouragement of development, the maintenance and enhancement of the autoprotective forces. The healthy infant is a being whose organic development has proceeded on normal lines, and is in cellular equipoise, a product of the resultants of sound heredity, wholesome antenatal conditions, and suitable environment, maintained within reasonable limits. Small variations are, however, permissible. We are usually compelled to estimate the status of development chiefly upon inferential evidence. We may expect little more to guide us than the testimony of our trained observation, until we shall know more of physiologic variants and the potentialities of persisting embryologic factors. Even where this general survey furnishes all that can be reasonably expected, there remains a larger source of evidence of which we have had as yet indicated only the leading facts and principles, viz., the internal secretions, the regulative nervous mechanisms, and the processes of oxygenation.

Biochemistry is a field from which we may expect practical therapeutic hints of even greater significance than from pathology. To secure a clear comprehension of indications and determinations, the avenues of knowledge are hedged about with difficulties, especially because physiology has not yet furnished us with sufficient working data in many important departments.

There are numerous simple as well as complex processes set in motion by abnormal conditions, some of which are, however, advantageous or economic. In the complex reactions to injurious agents, such as cause inflammation and infection, the organism needs conservation of its own protective substances. This is obtainable, among others, through maintenance of vascular balance, vasomotor tone, integrity of circulation in the spinal segments, activity of leucocytes and lymph formation, and above all, of the adrenal system.

IV

These protective reactions are beautifully displayed in the establishment of natural or acquired immunity. Among instances of favor-

at that CO_2 in excess in closed rooms can be reduced in hurtfulness power-fans, or other devices for keeping the air in motion.

V

The feeding of infants is now admittedly more important than y other agency in development and repair. Life, growth and the intenance of health in infants depends more largely on the integrity the milk supplied than on any other factor.

Advances made in the substitute feeding of infants (valuable as y are) encourage neglect of suckling. Among the well-to-do the ission of breast-feeding is increasing. Some physicians encourage thers to wean their babies without sound reason, often to curry or and gratify maternal selfishness. This vice is extending to the king classes. Working women find it easy to confide their babies lay nurseries, or professional care-takers, and to supplement their bands' incomes by work in shop or factory.

Dietetic regulation is capable of overcoming a large group of angements which, when they persist, pass into serious disease. estive disorders in infancy weaken immunity to infections of the trointestinal tract, which in turn invite severer infections, *e.g.*, erculosis, bacteræmia, acute toxemias. Nutritive defects form the is of many neuroses and psychoses, are oftentimes the sole assignable se. Cure of those childish nervousnesses so common, but so little reciated by parents, or by some physicians, fidgetiness, night terrors, omnia, spasmodic disorders, chorea, tics, eclampsia, hysteria, roses and psychoses, is accomplished in great part by full attention corrective dietetics and hygiene. It is wise to accept the nutritive lt as the basis of treatment till further light is shed upon the problem.

Careful dietetic treatment of subacute and chronic disorders of stion and their endless consequences cannot be over-esteemed, ugh it is often over-estimated. However efficacious regulation of ironment may prove in many instances, full control over the patient not always be exercised for the length of time—often months or rs—essential to secure full success. Holt says that in chronic stive disturbances in children beyond the age of infancy, careful etic treatment is the only measure which accomplishes anything manent in prevention as well as cure. It demands an extended iod of absolute supervision and control.

Where excessive intestinal fermentation occurs, local flaccidities

and atonies follow, a train of retrograde disintegration-phenomena is exhibited in the structures of the viscera and those which support them. Rhythmic action, a cardinal function of the hollow viscera, becomes impaired, loss of peristalsis, dilatation, inducing visceral ptoses and often irreparable invalidism, follow. Here dietetic regulation needs to be supplemented by manual treatment and other mechanical forms of spinal reflex and vasomotor stimulation. Vasotonic derangement underlies and conditions most diseases, and when established, there follow passive congestions, infiltrations of parenchymata of organs and their supporting structures, relaxation, dilatation, ptoses, functional alteration, and disintegration states. The cell-bodies in the segmental centers controlling the visceromotor activities become starved, inactive and upon their repair depends restoration of function.

A prompt and efficacious means of accomplishing this is by employing gentle alternating pressure on the tissues of the back adjacent to the spine, also in mild concussion of certain vertebræ along with regulation of diet and possibly some drugs enhancing or retarding adrenothyroid action.

A most material point in dietetics is to secure full mastication and insalivation, though this is too often overlooked. Children, many of them, bolt their food; nurses and parents are often careless or hurried and regard their duty done in supplying enough, often too rapidly and too much. This fault causes almost as many digestive troubles as unsuitable food. Surgery has simplified a host of hitherto baffling problems by offering the certitude of seeing and handling visceral tissues after removing concealing structures.

VI

A practical part of all hygiene or rational regulation of life is exactitude and minutia in all the acts, duties and pleasures of the day. These directions should be on broad lines, dominantly sketched. For a sick child we must always have plenty of fresh air; cool, but if too cold it tends to weaken the already impaired resistance in the lungs. As has been said, the opposite extreme, continued heat, progressively lowers vitality. By keeping the air in motion, heat is rendered less damaging.

The true purpose of the therapeutist is not only to restore the balance of health in the individual, but to reach much further and aim at perfection. His resources are, first and last, dependent upon the intrinsic resources of the organism; his prerogative is not, or should

: be, limited to restoration, but includes always systematic efforts development and amplification. This can be carried so far that reditary and inherited faults can often be eliminated if not in one n in two or three generations. The autoprotective forces, inherent wers for regulation, adjustment and maintenance of vital actions, ould be studied from various aspects and relationships, our reme- es always directed to repair and enhancement of the fundamental echanisms.

At the head of all forms of therapy stands preventive treatment. y this is not meant Board of Health measures. It would be absurd include the negative as a part of a positive proposition, except for e fact that prevention is largely partial and relative, hence must be ckoned as an integral part of any systematic therapy. The largest ncrete results within the possibilities of medical art lie in conserva- n, in the early recognition of abnormal conditions and modifying se, wholly or in part. We all have a more or less definite notion the scope of preventive measures and hygiene, especially as applied tuberculosis, syphilis, rickets, scurvy, lymphatism, etc. In respect deformities, inherited or acquired, many are preventable, others ediable if only recognized early enough and treated consistently ugh. Many derangements and diseases of adults exhibit their innings in childhood, *e.g.*, convulsions, whence arise local apoplexies epsies, palsies, contractures, deformities, etc. Bronchial attacks . their recurrences, foreshadowing asthma, likewise the milder roses and psychoses, lead to endless puzzling disorders. So also many derangements due to the unstable cellular adjustments of dhood. All this is entirely within the province of the watchful sician. The real difficulty is less his omission of accurate observa- and corrective measures than failure to secure the cooperation he family. To know, one must have opportunity to observe. The y of parents is to invite the attention of the physician to trivial- ming disorders. To do this is the clearest economy of money, ering and future disabilities.

Our duty is to limit to the uttermost the spread of transmissible ases. This is possible in proportion as (1) the general practitioner igilant and dominant; (2) the cooperation of the family, and (3) he municipality are secured. Medical inspection of schools is mplishing a silent but tremendous victory. This care is the e needed in view of the disastrous secondary effects of infections, nothing can condone omission of any reasonable precaution in isolation of those sick from transmissible disease.

VI

Fœtal and infantile growth is by no means a steady and regular advancement. Irregularities in advances occur in rate, in symmetry, in areas and from time to time changes are constantly appearing in speed and completeness. Wherever such asymmetries occur in growth impetus, where one part outruns another, the integrity of structure is imperilled and permanent abnormalities may readily arise.

It is by a knowledge and application of remedies to these fluctuations in the process of elaboration that the clinician can form estimates of the normal and the abnormal, of developmental arrests and faults, and find the key to many variations in health and vigor. A graphic demonstration of these facts is to observe a picture (like the one displayed) showing a skeleton of a newborn child magnified to the same height as an adult; note the grotesqueness of the proportions, the high cranium, the small lower jaw, the cone-like thorax, the dwarfed arms and legs.

In structural density the infant and the adult show a marked contrast. For example, the proportion of water in the tissues in the fœtus is 97.5 per cent.; newborn, 74.7 per cent., adult, 58.5 per cent.

The lungs often do not expand symmetrically, one side may remai quiet while the other expands in excess. Respiration is also irregul in the infant, being only rhythmical in sleep. The rate at birth is at twelve years is 20, and at twenty years, is 16 to 18.

In the newborn the pulse is so rapid and irregular that if occured in an adult some serious abnormality of the heart would indicated.

The young child is vastly more elastic, has more muscle, a less tendon, the cartilages contain far less mineral ingredients, the bo and periosteum are far more vascular, the peritoneum is also mu thicker in proportion; the medullary canals being filled with a redd oily fluid which later becomes marrow. The organs which give t attributes of superiority to the human animal develop much mo rapidly, viz., the nerve centers and the brain.

Especially dangerous does this irregularity of growth oftentim prove in the development of the brain and skull. The vault of th skull is formed in membrane, the base in cartilage. The bones of th vertex appear before those of the base, but at birth ossification is mor advanced at the base. The occipital and sphenoid bones are unite at their basilar portions about the twentieth year. The sutures usuall become obliterated some time after the complete formation of the

ull, but the time of their disappearance is variable. The fontanelles, the intermembraneous spaces at the angles of the parietal bones, ually disappear before the age of four years. The anterior fontanle is usually closed by the end of the second year. Sometimes it rsists through life.

During fœtal life the growth of the brain is rapid and at birth is of latively large size, approximating in form and relation to the adult rain. It grows swiftly up to the seventh year and increases slowly weight after that period throughout life.

Skull and brain grow—or should grow—correspondingly in relative roportion each to the other. Oftentimes they do not; either the one r the other grows too much, or too little.

The several bony plates, like the petals of a rose, should come gether and the ligamentous tissues ossify about the fifteenth or xteenth month after birth. They sometimes do so before the child born; then the brain is locked up inside, cannot grow; the convolus of its gray substance are compressed, the vessels are hampered, e ventricles encroached upon. Then result difficulties in parturition d a hopeless idiocy.

VII

The growth of an organ is seldom paralleled by the development its function. The liver, for example, attains a large size in the first ee years of life, but its microscopic structure does not resemble that an adult until toward the eighth year. In infancy the spleen may be ected with some chronic interstitial process, checking the develop-nt of its cellular elements, although the organ continues to grow in e and weight. The consequences of imperfect functioning of the leen may not become apparent until some infectious disease occurs, ssibly not until adult life. Inflammatory processes in the kidneys ay impair their functional development, although they may present normal appearance. Not only the etiology of certain chronic af-tions in adults, but also the explanation of various individ-l peculiarities in the course of the affection, are and remain a stery, from lack of expert attention. Too rapid growth may be ompanied by generalized morbid phenomena, and acute diseases y accelerate growth. The study of all conditions that may influence energy of growth is indispensable. During periods of accelerated wth the organ involved or the general organism is least resistant to urious influences. During early infancy and puberty the organism is wing exceptionally fast. The greater or less use made of a rapidly

'he child who begins right is best able to continue right; that is; who is endowed with the right potentialities and under right litions for advance, may be expected to progress and evolve nally.

n this chapter is set forth an outline of those environmental ors on which we can chiefly rely. The author quotes freely in es from one of the highest authorities on childhood, Professor am Jacobi, for two reasons: no man speaks from fuller experience isdom; also, the dicta of a leader such as he are often so emphatic o carry weight in directions where others might hold convictions, hesitate to state them so boldly and positively.

"If 17 per cent. of infant deaths are caused by congenital troubles, study those congenital troubles and obviate them." (See chapter 'Developmental Defects and Arrests," p. 1087.)

In this connection the question naturally arises, is it right or desir- to rescue and keep alive those who are irretrievably damaged, must always be a burden and a sorrow to parents or community? Do we save many who would be better dead? Assuredly we do; cannot, however, assume to decide so grave a question as who l be abandoned. Always there are a few among the most unpromis- who may possibly become useful citizens. Hence our plain duty employ the best methods of conservation available, "leaving to l the increase."

First, we must learn the nature, scope and remediability of con- ital defects, developmental arrests, hypoplasias, etc. The power utoconservation in infancy is enormous and lies along the lines of ernal influences, depending largely on the antenatal condition and iene of the mother, and begins at least nine months before the h. One-third of all deaths under twelve months occur during the month.

The primary requisite is for the mother to enjoy opportunities of oming and remaining a healthy, vigorous human cow, or milking- nal; but she is also an intelligent, responsible citizen. What she s not know instinctively she must be taught. "The newborn is just ninating its embryonal and fœtal evolution and expects to be treated a human animal and not like a calf." Where the mother does not wisely or avail herself of things needful she must be instructed and led. Environment is just as forceful as heredity, certainly along ie lines more so.

II

"A clean bill of health should precede matrimony. The clergyman who marries a couple unfit for the responsibilities of parenthood is a potential criminal. Ignorance of the laws or the facts is no excuse. If he does not try to learn the facts and the laws he should be punished, Health departments are responsible for the transmission of sexual and other infections. Laws must be enforced; facts must be searched for and necessary action taken. Those who assume the authority must be held responsible." Hereditary diseases propagate a number of other diseases, notably certain degenerative processes in organs and systems, leading to physical and mental devolution, hypoplasia, decrepitude. The line can be drawn with fair accuracy by any competent medical adviser. Also the clergyman who is to be of any utility whatsoever (*in the material domain*) must know enough of these conditions to judge, and must have courage to advise and act boldly and efficiently.

"Human society should become aware of its privileges, one of which is that those who assume to be guides in thought, action and feeling shall be qualified and conscientious. If they are not, away with them!—doctors, clergymen, lawyers, teachers, legislators, and all.

"The propagation of the degenerate and imbecile and criminal should be prevented. We have no positive laws yet to control the syphilitic and gonorrheic man who ruins a woman's life, deteriorates her offspring—if she has any—and impairs the human race. We have come to this, that half of us are obliged to watch and nurse and support the other half, many of whom should never have been born. In morals and in money the degenerate are an expensive luxury, an appalling detriment. The only protection for the nation, for mankind, is to assure a healthy, uncontaminated progeny. Strict laws are required to accomplish that; such laws as will be hated by the epileptic the syphilitic, and the vicious. (*They must also carry a hurt to th unfortunate consumptive.*) No law ever suited the degenerates again whom it was passed, and it is unfortunate that while disease and i competency and vice are to a high degree hereditary and contagio moral health and virtue are not so to the same degree.

III

"Altogether, babies have a strenuous time of it, not only after bir Heredity, degeneracy, or incompetency is often caused by soc influences. Financial temptations or necessity make women too oft

not the strong and healthy men, but the old and rich. Their
:n are having less and less vigorous offspring. Rich and prof-
boys spend their sexual powers on prostitutes and save little for
le babies. The lack of children in American families is not
; due to voluntary abstinence. Thus the future of the American
ıtion has to rely on the offspring of the immigrants, and the
can type of the next century will not be much influenced by those
ancestors came on the Mayflower. . . . . Thousands of
re prevented from contracting a marriage by pecuniary want and
ıpossibility of satisfying their sexual hunger except with prosti-
That is true not only with regard to factory hands, clerks and
yees generally, but to the picked men of the people." (Jacobi:
nt Mortality.")
any babies of most unpromising aspect, feeble, under-developed,
ıot only be saved but become vigorous, longlived, useful and
guished citizens. History is replete with examples, among
are Kant, Goethe, Helmholz, Licetus.
other love and breast-feeding together are capable often of accom-
ıg the apparently impossible. The mother's milk is only rarely—
t never—unfit food, if proper intelligence and persistence dis-
sh both herself and her medical adviser. Menstruation only
ırarily alters breast milk, nor do emotions, cares, worries, even
ate and distressful exhaustion, in any sense justify substitute
ıg. All difficulties can be overcome by the mother who cherishes
:ere desire to give her breast. The act of suckling and the
us of a real affection both combine to increase quantity and quality.
ıi says: "There is no such thing as absence of milk secretion."
nursing woman may eat any simple, wholesome food which ordi-
agrees and is pleasant. Always avoid absurdities, excessive condi-
; and all alcohol, permitting tea only in moderation, and no coffee.

IV

ıe nursing mother may not only attend to customary duties and
with advantage, but may fill her time as her station in life war-
She may attend social functions, the shops, entertainments,
led she will not forget she has a baby at home to welcome and
"The checking of babies at department stores is a convenient
ation which improves the chances of babies, women and mer-
s alike. Elections are no longer so exciting, dangerous or mur-
s as they were in our large cities as late as twenty or thirty years

Ophthalmia is a source not only of blindness but often of death, through septicopyemia, multiple abscesses, arthritis, vulvovaginitis, endometritis and peritonitis.

Since the tissues of the newborn contain more water in proportion than those of the adult by 10 per cent., loss of water is dangerous. Also an ample supply of water must be offered to the baby, otherwise physiologic equilibrium is lost, tissues deteriorate, organs suffer, especially the intestines, kidneys, etc.

Uric acid sediments and renal stones are comparatively frequent in young infants. No baby is given too much water; most suffer and do not get enough.

TO WHAT EXTENT CAN HEREDITY BE MODIFIED BY ENVIRONMENT?

I

Parents and relatives of children are interested in the problems of heredity chiefly to learn what can be done to overcome bad effects, whether known or suspected; also how to enhance favorable and regenerative forces.

This much is common knowledge. Favorable environment is efficient in proportion as it is exerted early enough, persistently and consistently enough. Desirable results follow favorable influences in proportion as the factors to be reckoned with are known and understood; also as good conditions can be secured of a kind and in a degree capable of amplifying latent energies; also as judgment is used in the selection and amplification of remedial measures.

The life history and career of the average individual is determined by three main factors: heredity, environment and will. The laws of heredity are still far from clear; becoming gradually known, though only slowly is their significance and bearing on daily problems being understood. It simplifies deductions to assume determinants in the chromosomes, whereby the responsibility of direction can be laid to this agency, but the problems are not yet solved. There are present in each individual certain ingredients, tendencies to weakness or vigor, forces which make for good or evil. These may skip one or more generations and appear suddenly.

Some of the characteristics which tend to recur in the same or analogous forms cannot be prevented by any known means except by selection of mates free from the vitiated strain. Since there are no official guides for mating in human beings, they must use their own

intelligence; must depend for counsel on experts in genetics, in eugenics, and abide by their decisions, otherwise sorrows and chagrin will be multiplied. As knowledge of the principles of parenthood and race culture grows, instinctive choices will come to be made.

"The struggle is now in the realm of the mind. It is a mental combat. Therefore strengthen heredity by mating fit with fit. Bettered environment and improved education do not create new germinal types. . . Immunity of offspring is produced only by immunity of the mother. . . The heredity of immunity and insusceptibility is one of the most important fields of eugenics." (Meyer Solomon, *International Clinics*, July, 1912.)

One thing is sure: best inborn potentialities cannot come to perfection except under favorable conditions of environment and training. Given two streams of tendencies, after the bad has been separated from the good it is essential to enforce adequate measures to prevent their mingling again. "Verily, what ye sow, that shall ye reap." The only method in sight to secure purification of the race is for children to be taught broad principles of biology, hence they will appreciate the importance of eugenics, parenthood and improved race culture, not alone in plants and animals, but in human beings. Well instructed children, upon becoming parents, are equipped with an instinctive consciousness of eugenics, which enables them to exercise wise determinations and choice. As to the belief fostered by certain forms of religious teaching that there are virile plants or human beings that will assert themselves and reach perfection in any environment, these rare individuals will be found on scrutiny to be always of exceptional stock.

The test of any plant, or animal, or man, is how capable it is of reacting to its environment. Man is, however, much more than plant or animal, and molds and shapes his environment to meet his needs, desires, ambitions.

When we are able to distinguish the factors of a good inheritance from those of an evil one, how shall we then proceed to eliminate the one and perpetuate the other? Again the answer is, by education in fundamental genetic principles and by molding public opinion. We can only slowly evolve and apply extraordinary measures which may seem to strike at the fundamental interrelationships of society, as in dealing radically with the unfit. We cannot do as did the Spartans, abandon weaklings and degenerate infants to die.

There are those who claim that natural forces and natural selection, the part which nature plays in everyday life, need not be influenced by intelligent guidance. In practice this is a perilous optimism. At

est, these natural agencies, unguided, can only work slowly, uncertainly nd with many defeats. Why then wait to apply this guidance and irection to human beings, when already all governments supply elective action to plants and animals?

Biologists generally teach that "environment can exert no heredi- ary effect on organization," *i.e.*, on acquired characteristics; hence cquired characteristics are not inherited or transferred.

II

Euthenics is the betterment of living conditions through conscious ndeavor for the purpose of securing efficient human beings. It deals vith race improvement through environment, while eugenics deals vith race improvement through heredity.

We can at least effect much good by the rigid control of the trans- issible diseases, and poisons like lead, mercury, and alcohol, which ake for degeneration by affecting propagation of stock. The problem f determining who is fit to marry and who is not; the issuing of marriage ertificates after conclusions are reached by judicial decisions, is at resent difficult, especially since lawyers have trouble enough in de- rmining who is, and who is not, insane. A public bureau that will brutally matter of fact, and conduct rigid examinations, is entirely ssible. A laboratory can and should be established where all nec- sary tests can be made for a moderate fee—and will be established hen women are really alive to their rights. These rights are to get a sband who shall be a proper father to their children.

Both boys and girls must have early education in sex hygiene. ex knowledge is of vastly more importance than food knowledge, or othing knowledge, or any or all the factors of industrial or cultural ducation.

The girl untrained in sex knowledge is in constant peril of worse han her life. Above all the follies which still obtain from the ages of arkness is the pitiable falsehood that any girl can by marrying ever reform" a man.

The whole subject of sex is at present far from solution. Time ill offer much enlightenment. Every young child should be taught ie principles of biology and thus learn to think in terms of growth, evelopment, reproduction.

As illustrating what can be done by enthusiastic euthenists to generate hypoplastic stock, Professor Leon J. Cole[1] quotes two xperiments: one the "Zero" family, of Switzerland. This family

[1] Popular Science Monthly, Nov., 1912.

in still-births, congenital debility, inability of the mother to
igh infant mortality, falling birth rate, tuberculosis in early
chopathy, defective development in all phases, general inferi-
ınormal sexuality, criminal and other anti-social tendencies,
m, weak-mindedness, etc. (L. Pierce Clark, *op. cit.*). The
ined production of wealth is by no means an unmixed blessing.
ence of classes has resulted entirely out of harmony with the
wholesome social evolution. Nations thus fluctuate in pro-
or retrogression.
ever, through careful selection, by breeding from only the
ilable individuals, much can be done gradually to overcome
y influences.

IV

above statements need not cause discouragement; they should
imulate each one to study the subject of genetics. Not one
safe from disasters due to hereditary defects as well as to
e, blunders or arrogant optimism. The future is dark unless
now the place each one occupies and the part each one plays
evolution, and this can be learned only through familiarity
ıds of current knowledge in genetics. Light may come sud-
the humblest observer, so it behooves each one to do his part.
esent there is a deplorable condition of indifference and ignor-
to the possibilities of race betterment. All sorts and degrees
eracy, devolution or hypoplasia exist; pathetic burdens occur
ımilies of even the worthiest, most estimable people. The
lividuals are usually isolated; the less marked too often remain
to break the hearts of parents and relatives. A large number
recognized till evil tendencies have developed into physical
ıde, mental alienation, criminality, or at the least, incompetence
y burdensomeness.
fortunate is the parent who is perpetually vigilant and wisely
the attention of a competent physician the earliest indications
ıpmental arrest or defect in a child, and who is frankly willing
ded in adopting necessary precautions and remedial measures.
stions thus opened up must be faced by everyone whenever
e or suspicions occur.

V

rete problems commonly presenting are those bearing on
or mental integrity. The wisdom and tact of the adviser

needed less reformation by experts in atypical children. Dunces, reprobates, truants, cruel and vicious youngsters, can, in great measure, be prevented by starting children right in the earliest years before plasticity, before the finer sensitivenesses and capacities, are blunted.

Transmission of somatic (body) modifications is all-important. Ground for belief exists that the germ plasm is modifiable. There is much evidence to the effect that by modifying and improving the environment of even the habitual criminal, the neurotic, the tubercular, the gouty and the victims of other hypoplastic agencies, the offspring is more or less improvable. The danger is that some children will be born worse than the parents. The worst cases should most certainly be prevented from procreation. It is not yet possible to purposely destroy vitiated offspring. The whole fabric of society rests on humanitarian feelings. Altruistic impulses may, and often do, go too far and become not only present dangers to the community, but, when in excess, are in themselves evidence of deterioration in mental balance, moral tone—certainly of irresponsibility in the individual who is animated by, and acts upon, foolish wishes.

The subject of degeneracy has been much clarified by recent psychologic researches. Exact testing of the minds of backward children has made it plain that a large proportion of seeming incompetents are instances of developmental arrest, rather than of defect. The integrity of the mind may be fair, capacity for judgment more or less good, though capable of functionating only at a lower level of intellectual efficiency. It is claimed by experts in juvenile penal institutions that, by removing physical limitations (as defects in eye, ear, nose, etc.) and subjecting the children to properly graded teachings, about three-fourths can be made to evolve into fairly good citizens. They may, and often do, remain juvenile or childish-minded, but are still well removed from the infantile qualities originally displayed. Maturity in them is slow, but progress in the better elements of mentality may continue far into middle life. Juvenile criminals are, however, almost always subnormal; the mental arrest is more final, constituting a permanent defect.

VII

Thus environment becomes a more promising factor in view of these increasingly exact findings. We are at least no longer left in a maze of conjecture. Thus also prevention of mental unfitness becomes more possible. Given opportunity to apply corrective measures, de-

velopmental guidance, a pair of "morons," foolish or mentally retarded parents, may be made to produce children better than themselves, and their grandchildren may become a marked improvement on the original pair. Similarly, we may find by investigation (if data be procurable) that the ancestral stock, far back, was good, or even of high grade.

When eugenics shall have become what Galton expressed the hope it would be—a factor in national beliefs, "a religion," it will be possible so to direct matings as to secure large improvement in posterity. There are, however, limitations which must be recognized and more clearly defined in the future. At present, we know that when an individual has enjoyed full privileges for mental development and fails to respond, there is an end to expectation. Such persons should not be permitted to beget offspring.

"Our characters are the product of heredity and of environment and not the sum thereof. It is not heredity plus environment, but heredity *times* environment, which makes us what we are. This is constructively conservative; for, if heredity be poor, good environment may make as much of it as poor environment can make of good heredity. Nature can in great measure replace bad birth, and bad nature can destroy the advantages of good birth. But, under the same environment, good heredity will yield better results than bad heredity." (Meyer Solomon, *op. cit.*)

VIII

Best results in schools for atypical children (peculiar, backward-minded, hypoplastic) are roughly estimated at a gain of about five (.05) per cent. In a paper on the "Undesirable Citizen," one of us called attention to the genesis and evolution of the trouble-makers, the wayward, the petty evil-doers, the difficult boys, who are largely the product of special influences exerted on them during the plastic years. A large proportion of children lack initiative, originality, impetus, right direction of energies. They are vacillators, over-impressionable to good or bad pressure currents (however unimpressionable to finer influences); they cannot run their own careers; are like discs of metal on which anyone can implant the coin-mark. They reflect the color of their accidental environment. Those with whom they come in contact may be decent citizens, or shrewd, vicious opportunists, who seek the plastic individuals to make tools of them. In America our acquisitive tendencies overbalance our

nicer impulses; we are inadequately safeguarded by wholesome traditions. Law appears to be devised to protect privilege, rather than to mete out strict justice. Hence arises an increasing group of flagrant defiers of the instinctive right impulses. Brilliant knavery is overmasteringly attractive to weak personalities. The clan instinct is strong in all boys, especially in the weak, the one who needs to be supported, carried along, to "go with the gang."

Hence it is plain that to punish for petty offences, or crimes, is barbarous, wholly ineffective, intensifies bad impulses, induces bitterness, a sense of injustice, ideas of revenge. The evil-doer should be safeguarded, trained. Some, a few of the younger ones, can be remade. None should be given responsibility till proven capable. Prisons should all be sanatoria, with hospital facilities, and provided with a staff of expert medical chiefs.

Reformation is always unpromising. Alcoholic and narcotic habitués are invalids from inherent defects plus evil habit formations.

"To me the two most sensible and practical propositions with which we have to deal are: (1) lowering the number of defectives, delinquents and dependents; and (2) improving educational and environmental advantages of the whole population. The first belongs to the domain of *restrictive eugenics;* the second to *constructive eugenics.*"[1] Dr. Solomon also quotes Huxley in speaking of the unfit: "We are sorry for you, we will do our best for you (and in so doing we elevate ourselves, since mercy blesses him that gives and him that takes), but we deny you the right to parenthood. You may live, but you may not propagate."

IX

Bleecker Van Wagenen, of New York, in a report of a Commission on Eugenics entitled, "*Surgical Sterilization as an Eugenic Measure*," says: ". . . it seems safe to conclude that nearly 1 per cent. of the total population is under custodial care and control in institutions all the time. This is a shifting and constantly changing population so that many more than that number in the aggregate are inmates of institutions in the course of any one year. Outside of institutions it seems conservative to estimate from 3½ per cent. to 4 per cent. equally defective persons not under custodial care. While upon the borderline, just above this class, there are probably several millions (perhaps four to five millions) or say 5 per cent. more, who are barely able to

[1] Meyer Solomon, *op. cit.*

maintain themselves or who just succeed in abstaining from ac
would bring them into the custody of the State. These are th
of inferior blood, who are so interwoven in kinship with those s
defective that they are wholly unfitted to become the parents
and valuable citizens. They carry germ plasm more or less
with defects and unless their matings are with better strains, d
tion is sure to follow in their family lines. Thus we concl
approximately 10 per cent. of our population, primarily throu
ent defect and weakness, are an economic and moral burde
90 per cent. and a constant source of danger to the national a
life."

It should be plain to any open-minded person that such
each and every family cannot be permitted to exist and grow un
The following quotation is from a personal letter of Dr. J. Ewin
who devotes a useful life, full of experience as a distinguished
to this urgent question of restrictive eugenics:

In producing asexualization I advocate the performanc
operation of ligature of the spermatic cord as described in
entitled "The Problem of Race Betterment." This operati
effective as castration and is freed from the conditions of m
The duct of the vas deferens is included in the ligature anc
procedure all that the operation of vasectomy accomplishes is
and in addition, and most importantly, the function of the
obliterated by the removal of the blood and nerve supply
abrogation of the sexual power. The operation simply imi
atrophic changes which occur naturally in the organs under the
of advancing years with little or no decrease in size. The
circulation is sufficient to maintain nutrition of the organs
production of the internal secretion which is necessary to th
functioning of the body tissues.

My opinions with regard to this subject are concisely
in the subjoined propositions:

1. The State, in the exercise of its duty as guardian of the
and of the rights of its citizens, and, as well, charged with
of affording protection against conditions which are harmf
social integrity, has the right to enact laws which will prevent
petuation of criminality and of degeneracy by inhibiting pr
in the confirmed criminal and in the defective subject.

2. The confirmed criminal and the defective subject may
fully regarded as in a state of disease, mental, moral and phys
therefore, the legitimate subjects for medical and surgical trea

3. Extended experience on the part of competent students of criminology and sociology confirms the opinion that neither education nor punitive measures are effective in restoring the criminal and defective subject to normal conditions.

4. As heredity is conceded to be an important factor in the perpetuation of criminality and degeneracy, through the power of procreation, the fundamental treatment of these conditions consists in the abrogation of this power.

5. Experience teaches that in many of the criminal and defective subjects inverted or perverted sexual desires and practices are the dominating factors of their disordered conditions. In such subjects remedial and curative results can only be obtained by depriving them, through the chosen surgical procedure, of the sexual power.

6. That the testes and ovary produce an internal secretion which is necessary to the normal functioning of the body tissues has been demonstrated. It is believed that after cord or tube ligature sufficient blood supply, through the collateral circulation which is established, is distributed to these organs to maintain this secretion.

7. Sufficient information has been gained from a review of the labors of those who have devoted time and talent to the study of the histological and pathological conditions found in the brains of the ament (imbecile) to make it not difficult to fix his status, and to make it the duty of the State to inhibit the propagation of his kind. His return to normal states by training is impossible—educational methods will help in certain classes, but it will not take from him the constant danger of perpetuating the flow of degeneracy.

8. The question of segregation as a method of the care and treatment of the defective class has been discussed for many years, and the plan has been in general force. Valuable as this method is its advocates fail to consider the subject in its economic aspect, and to fully appreciate the fact that the plan does not offer any opportunity for the return of the defective subject to his duties as a citizen, or his self-support as a member of the community, freed from the ever-present danger of perpetuating his kind.

9. Surgical procedures instituted for the prevention of procreation in the confirmed criminal, pervert, degenerate, idiot, imbecile, epileptic and vicious insane should not be regarded as a method of punishment, but as a remedial measure, the sole objects of which are the betterment of the human race, through the arrest of the continually flowing stream of degeneracy and the mental, moral and physical improvement of the defective subject.

PERSONAL HYGIENE

I

Personal hygiene includes the employment of various agencies concerned in conserving human efficiency by revising the conduct of life in the individual.

At the top stands *anthropology*, the science of man or mankind; the study of man's agreement with and divergence from other animals; of his physical structure, racial peculiarities, and intellectural nature; of the various tribes and races of men with reference to their origin, varieties, intermixture, customs, etc.; of the general physical and mental makeup and evolution of the human race. Anthropology puts under contribution all sciences which have man for their objective.

In the United States our people are a crude mixture of many races, some similar, some markedly dissimilar. The consensus of opinion is to the effect that, the purer the race, the more uniform the conditions; hence less of surprises and complexities occur.

A department of anthropology is *euthenics*, the science of raising the index of efficiency by improving conditions of environment. This, again, includes betterment of the race, the family, through suitable selections, matings (eugenics), and the habits of the individual (personal hygiene).

By personal hygiene we understand, determine, and apply improved rules of life and conduct—subjecting them to constant revision whereby latent energies, inherent capabilities for growth, development, and repair, may be conserved, and human dynamics so enhanced and amplified as to fit the individual to become the best his or her personal endowment renders possible.

For convenience in teaching, we may subdivide the subject of personal hygiene into three component departments which overlap each other, but which deserve to be mentally visualized for practical consideration as separate lines of conservation:

1. Conservative personal hygiene.
2. Constructive personal hygiene.
3. Reconstructive personal hygiene.

II

The power of environment to modify human fitness for better or for worse is enormous and as yet undetermined.

The practice of medicine was commonly divided into two departıts: (*a*) *prevention* and (*b*) *cure*. To these has been added a third, t of (*c*) *conservation*.

In pursuing methods for conservation there is also accomplished ch of both prevention and cure. So forceful may the practice of ıservation become as to prove the most important both to patient l to physician. Industries develop in proportion as rewards are ɜred. In the division of labor in medicine the only immediate ɾard for prevention comes through salaried positions such as those organizations, boards of health, professorships of sanitary science, d the like.

The chief rewards for the clinician come from the care and treatɜnt of instances of disability and disease. The subjects of conservaɔn and sanitation have never occupied the attention which their scope d possibilities deserve, because there is so little remuneration from ıching or enforcing measures in these lines. The public is, however, ginning to realize the vast possibilities in learning and practising nservation; hence there is a growing demand for knowledge. Where ere is demand there is always supply. The supply is being freely orded by all sorts of persons who see where they can earn money by ıching how to improve living conditions. While some of these have ɔd ideas, most of the ideas are founded on error; or rather, these perıs give what the public wants, good or bad. The only solid ground for ıl success in human conservation is an adequate knowledge of the damental principles of medicine, from biology up to the last refineıts of therapeutics. In the subdivision of specialism, therefore, re is need of experts on conservation, in personal hygiene. Here re is a field of research of increasing usefulness and reward.

Dogmatism is nowhere so out of place as in the teaching of personal ɟiene. It is characteristic of science perpetually to revise, amend, l reject ideas and methods. Views and teachings on personal hyne have varied and still vary because of diversities in individual te, belief or ignorance. When the subject is taught in medical schools teacher too often permits himself the largest liberty of rambling; seldom takes the trouble to review critically the mass of valuable lings scattered plentifully through literature and talks like the pulpit tor, assuming the divine right to teach simply because he occupies rostrum. The outline presented here is inadequate, but we claim t this subject should be accorded the same attention given to other nches of scientific medicine. It has points of contact with most of se. Some data and conclusions are cheerfully appropriated, others

made to serve as component or contributory parts. Our object is to bring these correlative factors into harmonious interrelationships.

III

1. **Conservative Personal Hygiene.**—This department of human betterment through regulation of conduct, large and varied as it is, may be here disposed of in a few words, that we may pass on to those inviting fuller consideration.

Under conservative personal hygiene we may include those common-sense measures, fairly well known and of recognized efficiency, which contribute to the maintenance of fitness in normal human beings, by improving environment, conduct and life, in the physical, mental and moral domains, thus encouraging the evolution of all inherent energies. Environment influences the tangible body and also the psychism. Everyone requires a constant revision in agencies for betterment, from cradle to grave—to exercise a ceaseless vigilance and industry. Everywhere, and for all, there are difficulties to be overcome. No full development can be achieved except by struggle, competition and unremitting endeavor. Victories or highest rewards not only gratify, but lead to increased powers, wider vision, mental and moral elevation, to the approbation of one's own conscience; indeed, to any height of endeavor, of character, to final oneness with the divine personality.

Memories are called forth, association processes stimulated, by chemical and physical agencies. Among the forces of environment producing reactions upon the consciousness, encouraging initiative, determination, selection, are chemical and physical forces such as light, darkness, heat, cold, work, rest, dryness, moisture, food, hunger, attention, sleep, etc., and always the mysterious and compelling force of electricity.

The main objects of life are to secure, appropriate and eliminate adequate amounts of oxygen, nitrogen, carbon, phosphorus and sulphur to meet the requirements of metabolism, and to convert these into, and maintain, healthy tissues.

Along with opportunity, there must also be intelligent guidance from within or without. Through experiences are formed habits of selection and rejection. The individual cannot be wholly receptive or passive, although to pursue conservative measures no large amount of effort is required. While it is desirable to accept with philosophy whatever state of life to which it may have pleased God to call one, the exigencies of every day, or week, call for some modification

of existing conditions, making for improved ones, in mental attitudes, temperature, ventilation, clothing, food, effort, attention and the like.

To secure what is plainly desirable one must guard against deleterious agencies, between which we are steadily learning to differentiate with some accuracy. Among these are mosquitoes, flies, hurtful degrees of light, heat, fatigue and the like. The subject involves the whole range of sanitation, federal, local, personal, in which the individual is first negative and next receptive, rather than active. Always the elements of fatigue must be reckoned with—a peculiarly hurtful agency in the young. Fatigue, leading to exhaustion, is capable not only of impairing function and retarding growth, but also of damaging structure, devitalizing organs, opening the door to any or all sorts and kinds of morbific agents, infective or metabolic. Excessive and continued fatigue is capable of defeating the best agencies for conservation.

2. **Constructive Personal Hygiene.**—The factors in constructive personal hygiene are, first, an individual who is not impaired by disease, but is not up to the norm, whose deficiencies or defects are capable of demonstration or reliable inference, and, second, the selection and application of constructive measures, modifications of environment, capable of amplifying latent powers and leading toward the degree of development of which the individual is capable, in accordance with inherent powers and limitations.

Here we have at command all the powers grouped under conservative personal hygiene and many more. The task is to determine the nature of the concrete problem, its possibilities and its needs, and to make wise, active and expert use of our resources consistently and persistently.

3. **Reconstructive Personal Hygiene.**—The factors with which we reckon are:

1. An individual of any age or condition in life whose constitutional vigor or health has been so depressed by disorder or disease in the physical or mental domain as to place him or her below the plane of customary efficiency.

2 The eliciting of all those forces for repair of existing causes or phenomena of disability which can be brought into action, and also the raising of the index of efficiency by bringing into the field of action hitherto unrecognized capabilities, rendering them available, till a higher plane of efficiency is reached than the individual has ever before enjoyed.

This can be done in more instances than is ordinarily regarded possible, and to a degree oftentimes far beyond expectation.

Among the reasons why this is not done as often as it can and should be are these: The individual, or those who exert (or should exert) authority over him, too often will not cooperate frankly, faithfully and consistently with the adviser. Again, medical advisers are too often content to act merely as repairers of recognizable disabilities and to lose sight of their higher duty as conservators of latent powers of both health and efficiency. Nowhere in the domain of medical art does there lie larger opportunity for gratifying results than in this realm of reconstructive personal hygiene.

IV

The world's most important conservation problem today is the development and direction of human intelligence.

Life, movement, being, depend upon the fullest capacity in the sentient mind, the cerebral mechanism, whereby our superiority over the lower animals is demonstrated. The ultimate destiny of our civilization will depend upon the degree of efficiency of thought-power in future generations. Greater mental efficiency is demanded not only in all modern industrial pursuits, but also in defensive and aggressive activities. Steps in advancing civilization are marked by increasing strains, burdens, insults, thrown upon the structures of the body, especially the most delicate of all, the brain and nerves. Each new crisis in civilization calls for the exercise of higher intelligence, increased cerebral capacity, better judgment, in "the man behind the gun."

Primary education, now in an unsatisfactory stage, is the domain in which best advancements shall be initiated. How to train the young child to evolve the best that is in him, at the earliest possible time and in such a way as to insure uniform, consistent progress, in the problem for today and all days. To this end much of the best modern thought is being devoted. Whatever else is taught, or not taught, biology should be included. No one can guide him or herself aright who does not learn to think in factors of life, growth, reproduction and development.

Body and mind are essentially one as receptors and transformers of environmental influences.

The ideal aim of health conservators is to reinforce inherent energies, to perfect latent or impaired powers. It is but a limited conception of professional duty merely to repair damages or injuries, to overcome effects of disorders, or even to cure actual disease. In the field of restoration large individual abilities are exhibited by the exponents of restricted medical specialisms. Best effects are, even there, due to

wisdom shown in dealing with the broader factors involved in supplying constitutional needs. The solution of most of these problems often lies in estimating the exact status of the grosser mechanisms and in correcting many contributory disabilities not ordinarily recognized as significant.

Every person, young or old, is capable of a notable increase in vital dynamics by revising modes of life. This is particularly demonstrable as middle age approaches and tissue elasticity subsides. From earliest years the child begins to retrogress, to lose pliability, adaptability; to fall into one or another form or kind of disabillity. Some of these deviations merge into serious retrograde changes, often shown by rigidities, densities, caused by faulty habits or vitiated automatisms, due to omissions of suitable variety in both impulses and movements, whereby alone symmetrical action and reaction are assured. The factors involved are both psychic and physical. The deadening effects of routine, of monotony, are well known. Stimuli should be varied; suggestion or autosuggestion is rarely adequate to preserve vital rhythm. Individual resourcefulness is seldom great, or only exhibited in restricted and specialized lines. Hence it is of value to invite skilled direction from one who has achieved a well-rounded familiarity with human perfectibility, needs, and derangements, and can judiciously particularize.

V

Human health, constituting as it does the basis of economics, is steadily coming to be recognized at its true commercial value. Breadwinners especially are awakening to this fact, and beginning to appreciate expert prefessional aid in perfecting and maintaining bodily efficiency. That physician is most wise and useful who omits no opportunity to estimate the fundamental factors in any problem presenting. Not only should he meet immediate exigencies, deal correctly with confronting difficulties, but he should search out and correct underlying and contributory causes, which may keep the individual on an inferior plane of potentiality. He should do much more—make occasions and seek earliest possible opportunities to learn all relevant facts bearing upon the vital status of those in his charge. To accomplish this the home group requires constant and varied hygienic education.

The tendency is for each good citizen to make the best of his condition, to treat lightly unobtrusive ailments, to forge energetically ahead, ignoring slight symptoms, especially psychic phenomena, so that, too often, serious states are revealed only when far advanced or too

late. This disregard of ailments is commendable; it makes for courage, endurance, renown; for character-building, success. Through such pertinacity only are the highest ends achieved. Carried to its logical limit, however, it lures the ignorant optimist to a state of perilous monism. Conversely, to err by overmuch self-searching leads to hypochondriasis, timidity, inefficiency. Most physicians are aware of this, but there are different degrees of awareness. Some impressions, even some convictions, are cloudy, inexact, or worse, fail to act as stimuli to right action. A nicety of judgment is needed in solving such problems. For instance, it will prove a boon to a man complaining of a slight dyspepsia for the physician consulted to discover and rehabilitate an organism never brought to that degree of vigor and stability which, if attained, would have enabled him to attain greater power in life. Hitherto he may have been held by removable limitations to some petty hireling post. He may be handicapped by physical defects, be wasteful in method, underdeveloped, lacking in some essential particular, or all these may combine to keep him low in the economic scale. Unwarned, confident, he often assumes increasing burdens and presses on to, or beyond, the limit of his working powers. Then there ensues some minor or major accident, or disease, and a useful life is warped, mind and body are distorted, perhaps thereby also complicating important collateral domestic or financial interests. All this peril or dwarfing could have been avoided by adopting one of two courses of action: (1) Had the family physician been observant, wise and, above all, dominant, corrective measures could have been instituted sufficiently early. (2) Had the individual himself been duly alive to his economic needs, advice would have been sought capable of establishing full working efficiency. It is equally important to avoid or overcome the oft-recurring tendency to apathy, nil admirari, laissez faire, "letting well enough alone," sinking into passive despair.

VI

Parents are not blind to the value of first-class working efficiency, however insensible individuals may be to their own ultimate advantage. For the relief of actual disease or damage, even more so for fancied ailments, they are often willing to consult a physician. When they arrive at the conviction of a need for general or special betterment they are usually prepared and willing to spend time and money on measures confidently endorsed. If, however, they would realize that the best and most complete plan is to consult a physician promptly and

ankly or to seek advice periodically as to how health may be retained' owers improved, and a relative perfection achieved, by far the greatest ains in efficiency would follow.

Remedial measures are efficacious in proportion to (1) the judg- ıent and care exercised by the adviser in searching out causes, and (2) he degree of cooperation supplied by the individual. Success depends pon a thorough estimation of the specific needs of each person.

Experience in endeavoring to solve the complex problems of in- efinitely lowered health, to get that uplift so desirable whereby we ıay make effective efforts previously unsuccessful, has impressed us ith the importance of securing greater elasticity of the tissues and romptitude in the reaction-times between controlling centers and utlying motor parts. This constitutes a key to vascular competence y enhancing vasomotor reflexes throughout the whole system. The rosser mechanisms often need even more attention than is afforded by ustomary methods of organic regulation, because without first achiev- ıg elasticity therapeutic results are not so readily secured. Full organic ompetence is not sustainable unless the supporting structures are main- ıined in normal degrees of mobility. The lungs, heart, blood-vessels, or instance, cannot do their perfect work in a contractured thorax. he abdominal viscera are unable to perform their full duties unless ıeir supporting structures are adequately strong and elastic to exer- ise normal counterpressure. The hollow viscera both above and below ıe diaphragm need to be held poised in their normal interrelationships, o that vital hydraulics, connecting tubes large and small, may suffer o interference from undue compressions. Poisons, endogenous and xogenous, work greater harm unless local stasis is relieved. No mount of other salutary agencies can accomplish much if the normal imuli to circulation lack something of necessary impulses and re- ponses. The most powerful drugs can do little for ultimate res- ıration of capacity if the great oxygenating laboratories, the muscles, ease to play their essential cooperative part.

The benefits which we know to follow physical activities are ex- lainable upon this same principle of responsiveness to reflex motor imulation through vasomotor subcenters. For those who are un- illing, unable, or organically unfit to avail themselves of open-air orts and muscular activities, as much or even more can be accom- lished by brief, but exact education in the cycle of normal motor im- ulses and responses, along with correction of local rigidities in the keletal structures, direct or collateral. There is needed a precise stimation of what is amiss in the particular person, by whatever means

the individual taste, opportunities, or organic competence makes practicable, and a correction, in so far as is feasible, of the observed shortcomings. By securing greater elasticity of the less-used structures we can accomplish improvements in many unexpected directions, among the chief of which is securing harmonious interreactions through systematic motor stimulations. The body is dependent upon wholesome motor stimulations for the maintenance of diverse nutritive processes.

VII

Normality of posture is essential to organic competence. Erectness is compounded of vertical and horizontal lines from which divers other lines depend. While curving lines make for grace, they tend to impair the power of support. The weaker the person, the greater are the curves exhibited. Much bodily weakness is conditional upon that exaggeration of dependent lines which evidences incompetence in the supporting structures. These supporting structures may be at fault at both origin and periphery. For example, the visceroptoses arise in central defects which usually can and should be radically corrected by enhancing the vital index through attention to the inherent fountains of force.

A secondary cause is loss of integrity in those agencies exercising support which is supplied by collateral and external structures. Where these are voluntary muscles their vigor must be enhanced by all means, among the most definite of which is suitable use by exercise.

The key to erectness, hence to skeletal efficiency, hence to visceral interrelationships, hence to an important factor in organic competence, lies in the maintenance of a normal posture of the thorax. This assumes the maintenance of a *relatively* straight backbone and horizontal position of the ribs. When the ribs remain *relatively* horizontal and are easily held well up to their normal levels, there is afforded adequate support to the diaphragm, the external and internal abdominal muscles, and to all those structures combining to afford visceral support. There results therefrom a surprising degree of improvement in organic competence. To secure this thoracic normality requires intelligent motor education.

Some backbones are too straight; if so, they are abnormal; often the vertebræ are fused together, rigid, unwieldy. The ribs in such subjects are usually flattened, collapsed.

The training of the body of the child in accurate, purposeful movements should be applied to all, not merely to a selected group. Specialization by picked athletes is altogether wrong, because those who need

most thus get the least. Inferior physiques require most training. Each individual should be educated not so much in the line of his proficiency as in that of his deficiency. The object of training is not overspecialization of the best endowed, but a well-rounded development for each and every one; not the overtraining of a few, but training of a race of men who shall achieve abounding endurance, energy, powers of resistance and initiative.

VIII

Ventilation.—Under this heading we have to consider the value of air in motion, of cold as a stimulant to tissue respiration.

Facts are said to be stern realities. From facts we can learn principles of action; from enough of them can be deduced scientific laws. In estimating facts it is essential that they be judged in their entirety, with full consideration of contributory evidence and relationship to other, collateral facts; otherwise we may continue to blunder and reach only partial or erroneous conclusions.

It is natural to appreciate and extol creature comforts, warmth and shelter after cold and exposure; sunshine after clouds and rain; a full stomach after starvation; rest after struggle; uniform cosy conditions of life after raw buffetings. Nonetheless, it is a fact, abundantly verified by universal experience, that peoples and races evolved in cold, cloudy, windy countries, such as those of us whose ancestors came from northern Europe, require as an essential condition of health and sustained vigor, and hence of happiness and efficiency, to be subjected to the very reverse of the above Sybaritic conditions of ease.

First of cold: While it is true that exposure to intense and prolonged cold can and does produce hurtful, even fatal effects, yet cold is, in moderate degrees, of the utmost value in stimulating our organisms, and in restoring our tissues to the norm when deadly disease agencies take hold upon us. This applies, *e.g.*, in pneumonia, in many forms of infectious fevers, and especially in tuberculosis. Cold raises the vascular tension in enfeebled children, increases appetite and nutrition, assists the conservative action of fever, and contributes to restoration of the vital balance. It is known that cold is one of the most powerful aids in development, one of the most efficient agencies for the cure of disease and relief of depression.

Heat, on the contrary, especially prolonged heat above 80° F., is one of the most powerful depressants, and may turn the scale toward or itself induce fatalities.

during cold weather, in a uniform temperature of 66° to 70° F.; to have just enough air coming in "to get rid of the foul, used-up, vitiated air, full of CO_2 and animal emanations, effluvia," etc., by elaborate "systems of ventilation."

As a matter of verified fact, confined air, surcharged with human exhalations, does offend the nostrils and induce distress, even faintness and real harm. It can be rendered endurable, however, by being kept in motion, especially by being cooled.

In short, catching cold is a process of infection superinduced by lowering of the autoprotective powers on account of remaining quiet a long time in superheated air while overclothed and overfed. It is an interesting, rather startling fact that half-starved, half-clothed people, overexposed to cold, as on a raft at sea for hours or days, do not catch cold. Nor does the pioneer in the Arctic outlands. Nor does the sailorman in the old-fashioned "fo'castle," though the modern sailorman, living in steam-heated floating palaces, does "catch cold" and develops tuberculosis to such an extent as to create alarm lest he become extinct.

X

Excessive light, especially sunlight, is only second to protracted exposure to heat as a destroyer of energy. A climate that is all sunshine and dryness—and windless—not only impairs somatic powers, but dethrones reason (Chas. A. Woodruff and many others).

During the hot, protracted, semitropical summers in the United States it is to the highest degree imperative to protect infants and young children from the midday sun and for several hours; nor is it well for them to remain very long in the sun, even on cool days, during the summer. Sunglare is destructive to vital resistance; the extraspectral rays exert a baneful influence nearly equivalent to the heat.

"Biotic energy arises from the transformation of those other forms of energy, heat, light, sound, etc., which react upon the transformer, the living substance" (B. Moore, quoted by Leonard Hill).

"A sense organ is not stimulated unless there is change of rate in the transference of energy. If a weak agent is to stimulate, its application must be abrupt" (Sherrington, *ibid.*).

"It is not the wind God tempers to the shorn lamb, but the skin of the lamb to the wind. Monotony of sedentary occupations and of an overwarm, still atmosphere endured for long hours depresses vigor, induces the atrophy of disease" (Leonard Hill).

Alternations of struggle and rest, of cold and heat, of hunger and repletion, evolve vigor, stamina, efficiency.

A child long confined in the schoolroom is in a constant state of nervous tension. He considers alternative lines of purpose, of action, is excited, but passive, held to inaction; the natural outlet of energy, muscular responses, are not permitted to follow and relieve the overstrain on body, mind and disposition. Such a child must be relieved by permitting free action once in so often or mind and body will both suffer seriously. Yet the city child who is well fed and irresponsible, who runs the streets freely, can and does grow to a size and strength comparable to those of a country child.

Muscular exercise affords varied and valuable fields of usefulness. It relieves the heart by emptying the veins; it replaces fat by muscle and thereby prevents the stagnation of blood and lymph in tissue which does not spontaneously expel it; it increases oxygenation of cells and tissues, and it enhances digestion and metabolism. In the brain-worker at his desk the heart is accelerated by his work; his blood-pressure is raised; but he has neither muscular activity, change of position, nor respiratory activation to help pump the fluids around; constriction of the arteries (produced by excessive toxic wastes) in the lower limbs thus invites degenerative vascular changes.

Only by free activities in the open air can we expect to maintain natural resistance (immunity). Any educational method which interferes with spontaneous movements does more harm than good. Strained attention, continued, not only fatigues, but exhausts; it produces lasting and serious damage on growth and development in both mind and body.

RECONSTRUCTIVE PERSONAL HYGIENE WITH SPECIAL REFERENCE TO CHILDREN OF FEEBLE POWERS AND LOWERED RESISTANCE

I

The upbuilding and repair of all children, especially those who are weakly or convalescent, should be considered on broad principles, the basis of which is *elaborate thoroughness and abundance of time.* This involves special attention to dietetics, including a critical estimation of varying states and capacities of digestion, all the ordinary hygienic measures, and the hopeful use of some drugs. ***There must be insisted*** *on for such*, both during average health and during illness and convalescence, *more rest for the mind and body than is necessary for the average child.* All outings and exercises, both active and passive,

ıould be supplemented by rest, lying down for as long a time, it may e minute for minute, as the active periods. This rest is necessary) enable lowered organic processes to regain their customary tone, and ;pecially to secure definite gains. It will often be necessary to pro-ɔde food by a period of rest, to enable the digestive activities to ave full play; otherwise the highly sensitive nervous distribution to ıe digestive apparatus will fail of its full energizing. Mental or emo-ional agitation impairs the even flow of the circulation, so necessary for he best work of weakened organs, particularly the brain, whence ;overning impulses perpetually flow, dominating the body and spirit. Therefore, too, the emotions must in the weakly be not only kept well ınder control, but subjected to the least possible disturbance or exalta-ion. The temperaments (or mental attitudes from which they view fe) of all children require steady and patient training. In the case f strong children, equipped with clear, dominant, healthy minds, it is ıdoubtedly true that fair results come somehow from very diverse ıd ill-directed influences; but for the weaker ones, impressionable or ıathetic, thorough, conscientious study and specially directed meas-ɔs are required.

II

For such little folk it is not enough to prescribe suitable medicines ɑd enumerate casually a list of easily digested foods which the mother ɜll provide, nor to direct proper bathings, outings, and other general ɔasures. A thorough systematization of the entire daily life of the ɨld is infinitely more efficacious than the most accurately selected ɔdicines or the use of that innumerable host of children's foods with ɔich, in the form of specious descriptive circulars, the enterprising .emists flood our morning mails. *The best tonic for the stomach is od carefully prepared*, such as a fairly intelligent mother in even the ımblest walks of life, if rightly directed, can readily afford, but always ·ovided that the careful preparation, the times and circumstances of lministration, be wisely chosen and rigidly adhered to.

Predigestion of food-stuffs offers undeniable safeguards to the eakened, toneless digestive tract, but robs the pabulum too often of at savoriness which is essential to acceptability, and hence imperils)petite.

While exercising care as to the quality and preparation of foods for eakly or convalescent children, it is imperative to *bear in mind the ·ed for suitable variety*. This fact we have time and again verified.

A child will often be presented who is fed with the utmost care and regularity, oftentimes under the best of medical advice, and yet its progress comes to a standstill or it is seen obviously to retrograde. Upon inquiry there will be revealed much sameness in the diet-list, otherwise properly adjusted to the condition for which it was orginally outlined. The little victim's soul comes to loathe and abhor the sight of flabby paps, occurring in dismal routine, or the same old wearying round of bread, meat, and a dab of vegetables. If to these is now added a more varied dietary, revising the menu day by day, even lapsing into a taste, now and again, of articles ordinarily forbidden yet savory and tempting, great progress will soon be obvious.

Sterilizing milk for temporary use during hot weather in cities, often leaves anemia and tonelessness, even scurvy, in its train if its use is persisted in. There is a value in the vital properties of fresh milk not to be produced or retained by any artificial process.

The utmost care needs to be observed, however, first, in the quality of the milk, which includes an estimation of the health of the cow; secondly, strict regulation as to the treatment of the milk while being collected and immediately thereafter, and, finally, the greatest conscientiousness in securing cleanliness of the containing vessels. These conditions, though difficult, are becoming more and more possible as knowledge grows, and if fulfilled, will bring a perfect article to the consumer.

The points which certainly do not obtain adequate attention are the *thorough systematization of the when, where, and how much of the foods shall be taken;* what *varieties* shall be insisted upon; the time, kind, and suitability of the bath; the amount and character of exercise; and, above all, *definite periods of rest before and after feeding*, so that the organs shall be able to act deliberately. First, then, when confronted with an ailing child, one who is not ill, but far from well, when appetite is variable but small, when sleep is restless, the digestive organs manifestly disturbed and temper fretful, one that fails to hold its own in play among its fellows, and, what may not be ignored, whose weekly school report shows decided backsliding—first, look the little fellow over thoroughly and in all parts and functions.

There may not be one organ more amiss than another, though the most obvious faults will usually be seen in that avenue to all vital power, the *prima via.* There may be yet no falling off in weight, a far more instructive index in a child than in an adult, nor an obvious anemia. There may be a quicker pulse than ordinarily, a change in the heart-sounds which the initiated will recognize but cannot so clearly describe:

re probably will be found a rise in temperature, slight but unmis-able at times, at others subnormality well marked, and neither attention nor other exertion is readily sustained. The child, in rked contrast to its healthy comrades and itself at other times, is ling to sit aimlessly, if not a martyr to energetic task-masters to an overstrenuous conscience which drives its willing victim to verge of perpetual exhaustion, and often over it into the pit of ıplete collapse.

Such cases as here pictured are common enough, if only the eyes open to see them. They escape attention only too readily until ıe malady seizes them in all their pitiable weakness, and life is edily quenched. It is a worthy quest, then, to seek out and rescue se from, it may be, no picturesque fate, but an everpresent menace; ehabilitate these unresilient little bodies and even make them better n before; to put them in the way of a sound bodily equipment for ir life-work anon.

III

Here is a sketch of *modified rest treatment* which produces ex-nt results when all other efforts have failed to start a child along ine of progress. Put the little one in bed from a few days to a week nore, and *write down distinctly for the mother a strict schedule, ng the exact hours for feeding.* These may be the ordinary three ls, with some little fluid food taken in between times, or, better, ct four meals to be given in the day, at, say, seven, twelve, four, and t o'clock, the largest meal at noon. Omit the tonics hitherto given add digestive ferments or malt, or both. Let the day begin with a ıge-bath in a warm room; then a light breakfast, daintily served. he early afternoon let some one rub into the trunk and limbs an oil; e oil will do and much of it is thus absorbed, especially if one-third soap liniment is added, which probably aids the osmotic action. olin, diluted, is best of all; changes are desirable in all skin applica-s. This serves as a form of passive exercise and also as a nutri-t, or at least as a tonic to the skin, surface blood-vessels, and neous nerves. The surface should be thoroughly wiped off rward, that no foulness remain. We have seen children immensely efited, even among the poorest dispensary cases, from this one sure alone. Above all, in the early course of these measures, if child manifests a desire for toys, they may be allowed sparingly, *aggressive entertainment by overofficious persons is a harm and an*

t is unwise. The motion is both tiresomely regular and subject dden irregularities. The persistence of one kind of pronounced unusual motion is bad, not only producing relatively unsound ı, but keeping up a prolonged molecular agitation which has little commend it. If the infant is awake and sufficiently old and alert t up and look about, or to be forcibly held by the nurse in an ght position, a strain is put upon the spinal column. Thus inuous mild concussions are administered to the spinal cord and ı; thus the eye is put upon the strain, reacting directly upon the ı; an element of excitement is introduced, and physiologic irrita- y is a probable result.

The *heart is capable of much improvement*, and demands the est attention to varying states. If a baby starts out with an nically sound heart and succeeds in getting its whole mechanism leveloped by living under wholesome conditions, as to steadily ease its vigor and competence, then development of the heart will he very foundation of future power and the ground of reliance n illness or strains come. It will serve valiantly to the end of t age, spent under manifold exigencies, both physical and mental. he repair of damaged hearts mental rest is of more importance physical inactivity. Moreover, there are more perilous cardiac s than valvular diseases, though they may not be so demonstrable. icious attention to a weak or damaged cardio-vascular mechanism accomplish much and is best afforded in the line of regulated rities.

IV

The *development of the skin* is of paramount importance in the ıg, as upon its capacity to endure changes in temperature and other s will depend much of the future resisting powers of the indi- al. Some children have the layers of the skin unformed from the and it never acquires normal activity. There is quite a large ety of skins obviously different to observant persons—the firm, y, velvety skin of health, the pallid, flabby, or leaky skin, readily ming overmoist, loosely attached and wrinkling readily, or the w, harsh skin, either flabby and toneless, or stiff and inelastic, ring to the muscle sheats. Some skins are insensitive and react to st no stimulant; others chafe and get out of order if only thin cloth- press upon them, hypersensitive to the simplest hurtful agencies. The skin of a red-haired child is always tender and usually beauti-

ful. Children predisposed to tuberculosis or scrofulosis have poor skins, which can be and should be immensely improved. Various neuroses show in the skin. In short, the surface of the body is of vast activity, and the conservation of this large part of the organism is of critical importance.

Now, as to *the means of improvement* of the skin in our control. We believe if babies were anointed from the first with oil, and cleansed by rubbing them off, not using water, or but sparingly, for weeks or months, their skins would become more vigorous than when soap and water are freely used. This we have proved by a series of cases observed (and published), three of whom were our own offspring. Exposure of the skins of infants to the air of an equably heated room is wholesome, and they are better for as much exposure as possible, always short of chills. In America we are subject to such sudden and extreme changes that we dare not allow this so freely as is safe in many other countries. The exposure of knees and shoulders in children not the most robust is dangerous, unless carefully watched and promptly covered at the approach of chilling conditions. Indoors it is of use, outdoors not to be recommended. To go barefoot is wholesome for most. Almost never do children hurt their feet, and thus only are the feet symmetrically developed. They do not increase in size noticeably We know of numbers of Southern girls with beautiful feet who ra barefoot in warm weather until they were almost grown.

Cautious and repeated exposures induce an increasing tolerance the skin which will greatly strengthen the whole organism. T clothing at no time should be any more than is necessary to prote Overswathing lessens energy; it throws the volatile elements of ex tion back into the blood and thus directly poisons. The skin should able to throw away entirely and promptly its effluvia, which should offered free escape, or its retention may damage the lungs or kidne When we bear in mind *the capacity of the surface blood-vessels, how greatly vascular dilatation or contraction alters the state of varying blood supply to internal organs, also how large is the amoun matter excreted by the skin*, and many other points involved in functional activities, we at once recognize the importance of preserv its integrity at all times. If these structures are anatomically un veloped or functionally impaired, they demand our closest attenti Natural means are best, judiciously controlled. Exposure is impo ant, always with caution.

Bathing should be frequent—daily, indeed, or in hot weat oftener—in as cool water as can be enjoyed or well endur

but gradually lowered if unaccustomed. Bathing should be followed by thorough drying and rubbing and prompt covering; weakly folk should lie down for a time after. If chilled, let them get into bed for a time until complete reaction comes or fatigue goes. When bathing cannot be so well endured, at least as often as may be indicated, then a dry rub will suffice, especially after exertion and exceptional opening of the pores. If all this tires the child, it should lie down, and the work be done for him by another person. *Soaps are to be used sparingly* and only for cleansing. Salt is almost as cleansing and more stimulating. If the skin is tender, bran decoctions added to the bath will soothe. Ammonia or sulphur added to the water has value, rendering it soft and exerting special effects. To begin cold bathing, let one unaccustomed stand in three inches of warm water and be sponged off in cool and cooler water. The custom of the Greeks to exercise naked anointed with oils has much to commend it. The rolling in the sand of the arena in wrestling was accredited with benefit, and no doubt rightly. Wading at the seashore and digging in the sand is analogous, and much to be commended if not too prolonged. Swimming comes next to bathing, and is among the finest agencies for invigoration of skin and muscles. Remaining in the water longer than half an hour is of doubtful value, and over an hour is a strain, and for several hours is hurtful to any but the strongest, and does them no good. Water colder than the air of the bath-room is often hurtful for the strongest and of little or no value to any. Shower-baths and needle-baths are terrifying to most children, and possess no advantage over sponging or plunging. It is best for little folk to encourage cool bathing by gentle gradations, and to make of it a reward or frolic. The air of the bath-room should be warm.

V

The *exercise of the lungs* next to the skin requires much attention. First, it is necessary to make sure that the avenues to the lungs—the *nose and throat—shall be clean and healthy. Upon proper lung action depends the aëration and purity of the blood*, and through these the complete activity of the remotest organ. *Upon the integrity of the epithelium of the respiratory passages depends in great measure the defense of the organism against the onslaughts of many microbic poisons.*

The nose and nasopharynx must be kept free from irritations and pathologic changes, which might limit function or obstruct the in-and-out go of the air. *Upon the competence of the lung expansion will*

at first be used, and, later on, as strength grows, the one hand or the other, not neglecting either. Both the right hand and the left may thus have their adequate employment, and even for stronger children this is of excellent utility.

The next step in this direction is the use of the medicine ball, which with many experts has become quite the fashion. This so-called "medicine ball" is merely a sphere, made up of soft material, weighing from three to six or seven pounds, and covered with soft leather, the rough surface out. For little children it may be about the size of an orange, or preferably a little larger, as being convenient to hold in two hands. This, passed or tossed from one to another, requires more skill than the bean-bag, and may be used in the same way that a foot-ball is thrown and caught, either with two hands or one hand, and soon a very large measure of skill is acquired and interest incited. When the regulation or prescribed amount of passing has been done, then it can be stopped for one or all the players. A watchful caretaker may learn this amount for himself or herself, or act under specific instruction as what to do and what not to do.

VII

The most important element in all games is the incentive of competition, even if that competition be with one's own self. In all those exercises which are devised for the purpose of keeping up a consistent interest a much larger amount of activity may be used, and with less reactionary fatigue than with any form of exercise which fails of this quality, no matter how eagerly one may pursue it as a measure. The converse point is, however, that vivid interest may cause a weakly person to do too much, even when he is endeavoring to execute some act with skill in which he himself is the only competitor. When, however, the competition is with others, the element of excitement is added which may become harmful to those insufficiently strong. Of games many of the larger competitive kinds are manifestly unfit for children not overstrong. Match games of foot-ball, or even base-ball, are out of the question. Milder competitions, as in shinny or rowing, are of doubtful value; but golf is a perfect game, and can be regulated for the feeble and the strong, the young and the old, of either sex.

The evidences of overexercise in children or in weakly persons must be carefully noted. Mere breathlessness is no objection, and is easily recovered from if the organs are fairly sound. Also, a profuse free sweating is harmless enough unless after this goes to the point of

rating the underclothing, hence exposing one to secondary chill, omits to rub dry or change promptly. If, however, with very all exertion sweating comes readily, and, instead of being accom- ied by a normal reddening of the surface and the face, the person omes pallid or bluish and loses the normal luster or brightness of eye, then caution must be observed. If after small exertion there een a sort of trembling of the limbs, the face, and the lips, this ans that enough has then been done, and possibly too much. If ditually noted in the same individual, the amount of exercise must limited until by slow degrees and through other means adequate ngth is acquired. Soreness in the muscles afterward is natural of no gravity, though often a source of needless anxiety.

It is a good point to note the face, whether it be ruddy, pallid, or sh, as an indication of benefit or harm from exercise; not that it is llible, because some powerful athletes, men of greatest endurance, ome pale while in action. This is, however, unusual. The pulse useful indicator, too, and while, of course, even the most vigorous ple who are in moderate condition have their heart action im- nsely accelerated under sustained exertion, nevertheless this exces- rapidity and loss of force usually mark the limit of their capacity, l the effort must not be kept up too long, as is often done under itement. If the person is in good condition, he is likely to have ll, strong pulse, only a little quickened over the ordinary rate.

We have repeatedly examined the pulse and heart of boys under ying strains, such as a prolonged foot-ball game or base-ball match; which there was pretty constant action, and have noted that the dition of the pulse in those otherwise in equal condition varied much with their excitability. And inasmuch as this excitability ne person reflected upon the pulse means rapid using-up of pabulum rapid oxidization, along with wear and tear of the nerve and other s, therefore it is fair to assume that the rapidity of the pulse is a l indication of the using-up of reserve force. If the strain on the t is too severe, the result will be a proportionate exhaustion.[1]

tissues of young folk are so clean and elastic that an excess of vascular pressure can exert less harm than in the case of adults.

heart not only needs to be of proper size, shape, and tissue petence to fit the body, but the tension in the arteries and the lity of its venous competence may be ample or lacking; when this elow par, the heart acts irregularly and laboriously, and is easily ried and its force soon spent. This is shown in dyspnea and

[1] See chapters on Blood Pressure.

l physical, encourages symmetry, and fortifies against bad-habit rpings.

We have advised this life for a boy not ill, but still far from strong, ɔut whom it was most natural to be gravely apprehensive lest the ɛriment should fail or prove disastrous; nevertheless, without nself being at first particularly pleased with the experience, this np-life succeeded in accomplishing what no other combinations d been able to do, even of the most carefully selected or expensive ıds. The irregularity of feeding, lack of sleeping comforts, the s of various civilized luxuries notwithstanding were offset with best ɛct by the simplicity of life; the inculcation of independence of little ıgs ordinarily provided and thought to be needful; the absolute uralness of motions and attitudes and things done; the early hours ɔed and even earlier to rise; the constant breathing of perfect air, ɛther by night or day, wet or dry, it mattered not, and many other ıts too numerous to mention, produced a result most satisfactory. en in doubt, it is always well to resort hopefully and fearlessly to for some weeks in the woods.

Morals and religion in these surroundings need little teaching—a t will suffice, and this, to the narrowed mental horizon of a young son, is a vastly important point—and nowhere better supplied than ɛhe woods or wilds. Confusion is usually produced in the con- ts by special or didactic ethical teaching, and this is a much worse ıg than ignorance, which is a clear field for the intuitional under- nding.

IX

Development of Muscles.—There is still an impression prevailing ɔng even the best teachers of physical culture that development he muscles exerts of itself a particularly valuable influence upon general constitutional vigor. This is true only to a very moderate ɛnt. To be sure, the exercising of the muscles can scarcely be ɛied on independently of certain collateral coordinative acts involv- the healthy energizing of the vital organs. By quickening their vity through the circulation and stimulating the ebb and flow the blood throughout the motor mechanisms this does improve rition, and, to a certain degree, enhances generally the vigor and ɛer of the whole economy. Exercising the muscles in vigorous sons with sound and competent organs adds to the usefulness he trunk and limbs, enlarges their capacities, and is of permanent

value. In the class of cases under discussion this is also true, but with many important modifications. The heart may be thus hypertrophied or weak spots unduly strained. The most important condition of the muscles, voluntary and other, which can be attained, is *a well-sustained elasticity.*

Let us review for a moment the different kinds of muscular actions. There are the voluntary and the involuntary muscles; ordinarily only the former are considered under the subject of exercise. The effect upon the involuntary muscles is a very important one, however, and precedes and should proceed *pari passu* with the stimulation of the voluntary mechanism. It is conceivable—and, indeed, we have seen instances which illustrated this—where individuals have acquired a species of muscular monstrosity by having their voluntary muscles so exercised as to increase their size and power out of all proportion to the organic capacity of the individual. This produces an overgrowth of a kind which is not only almost valueless, but a distinct menace and an evil example. In the exercise of the limbs we may divide the kinds of energy into those of swiftness or speed and of power, which may be again divided into the combination of both swiftness and power. In acts of muscular swiftness we have a very intimate connection between the motor center and the muscular mechanism, in which the center is more exercised than the limbs in proportion as we try to produce accuracy of movement with suddenness. In any muscular action involving mere power—as, for example, lifting a dead-weight there is very little effect produced upon the motor center, but the strain is directly upon the muscle used, collateral muscles acting with this, the tendons and framework, and particularly the heart and peripheral vessels. In acts which involve both force and swiftness along with accuracy, there is a complexity in the physiologic act, and a wide-spread strain is thus placed upon the mechanism —as, for instance, rowing a boat as rapidly and as long as possible. There is, again, another form of muscular action which involves a considerable strain, too often overlooked, and that is the passive physical tension illustrated by the strained muscular equipoise of a cat lying in wait for a mouse, in which almost every muscle of the body is in tension, including the controlling nervous mechanism in the brain, which here is in a form of concentrated attention (expectant attention). This latent energy produces considerable fatigue, and directly in proportion to the degree of excitement and concentration of attention. It is familiar to all, and most of us can appreciate how fatiguing it is to stand for a long time, or to hold on to an object, as even a

by in the arms, the tiller of a boat, or the reins while driving a horse. ıe strain is doubled by an excitement which may again be emotionally ıggerated to the hypersensitive or overconscientious person in the rformance or continuance of an act. It is not so familiar, perhaps, but ually important, to realize and prevent that sort of *fatigue which :urs in those who must remain quiet*, but who strain themselves by bjectively aiding in carrying out similar strenuous acts by another in eir own minds while watching them. For instance, an excitable per- n looking at a match game of foot-ball, influenced by eagerness for e success of one side, involuntarily puts forth an immense degree of ıergy by his desire to help along the others. Indeed, we have known invalids who, while watching such contests in which one of their own mily was contending, became seriously exhausted by just this sort passive strain or expectant attention.

X

There is a distinct physiologic relief afforded by the active forms :xercise which result in temporary breathlessness when followed by iods of rest. Vascular and mental overtension is lowered by profuse :ating; excitement is relieved to a great extent by a normal or custom- overaccumulation of carbon dioxid, which is itself a sedative. It is well to bear in mind that for children intrinsically weak, both their muscles and in nervous force, and whose organs are also ow the average power of their other parts, muscular exercise must be lged about with many safeguards and wise modifications. It doubtful whether such children should be given much special :rcise for their muscles alone, such as by pulley-weights, dumb-bells, d gymnastic efforts, unless these be of the lightest and in combina- n with other things, while it is equally important that they should not allowed too large a scope for exercises of a complex nature. Delib- te and continued acts, of which carpentering and gardening are ıiliar types, are the best. Indeed, the use of tools, involving as it s interest to the mind, is second to none in value for young or old, ık or strong. Complex exercises, involving both force and swiftness, uld be gradually worked up to. The most perfect form of gradual roach is in the form of regulated exercises devised by the Swedes, :rein the muscular acts are reduced to their fundamental principles orce and direction; and in the hands of a skilful operator a person is step by step from the simplest acts to the most complex and forceful s, and during this process the organs also grow accustomed to the

gradual strain. When the individual is vigorous enough to perform little acts of skill, incentive is thereby added and the muscular work is better endured. Later, minor competitions have their place, and so long as the competitors are held in due restraint, all is well, and great benefit results. If incentive becomes insidiously merged into excitement, then a peril threatens. Exciting competitions are only for the strong; innocent incentive in the form of music during muscular exercises is often added with advantage. This is particularly illustrated in the exercises of the German Turn-Verein and Turn-Gemeinde.

Dancing is a most wholesome exercise, if only it be not superadded to or grow into undue excitement. "Fancy dancing" for girls is of special value, graduated, of course, as it brings out the graces as well as strengthens the muscles, teaches equipoise, and especially benefits the loins and back, the weakest places, and usually the most undeveloped parts in females.

XI

Development of the Nervous System.—The development of the nervous system has points of similarity to the growth of a bank account, and is subject to somewhat the same variations: at times inadequate, again fairly sufficient, on extreme occasions running so low as to come to the verge of being overdrawn, but under no circumstances can it be excessive for the requirements of the child, if the growing needs are kept in mind. Nervous force grows most satisfactorily by slow and deliberate degrees; excitements of all sorts are perilous, inducing a waste in one way or another. Only robust natures accumulate enough to squander, lest peradventure the account be suddenly overdrawn and bankruptcy ensue. It is popularly admitted that the world is swayed by vigorous nerve force. Language is replete with terms making nervous energy synonymous with courage, endurance, wisdom, and all those factors, in short, which are embodied in the term "success." It is alone the lack of nervous force which sometimes makes inefficient an otherwise sound bodily organism. On the other hand, a feeble conformation, endowed with vigorous nervous force and energy, constitutes an efficient engine. An adequate accumulation of energy in the nerve-cells and centers is the very fountain and mainspring of a wholesome life. As we possess little or much of this are we useful or negative beings; whether our actions are mainly mental or physical, it is the same. When this energy is exhausted or run down, it must be wound up again,

but, unlike the clock, it requires a long period of time in accomplishment. Moreover, during this time all the vital organs tend to deteriorate structurally while this controlling force is withdrawn. To acquire nervous vigor its growth should suffer few and small interruptions. We see among country folk, laboring men, and savages, natures which are relatively little disturbed by protracted drains on their vitality, especially of the kind which induces physiologic irritability in more complex beings, and this is due largely to their slow growth and simplicity of life, storing up cellular energy. Such folk become not only well filled with force, but tenacious of it and well balanced. If their store is suddenly or excessively drawn upon, they can well sustain the tax.

XII

Children whose lives are passed in one long monotony may not be so bright and alluring as are some others, they are far more stable, and better able to labor and endure. Their observation is simpler and slower, but their concepts and inferences are apt to be clearer. This storing-up of vital energy should begin before birth. The about-to-be mother should sacrifice something to enable her to live quietly and healthfully. A vast deal of harm would be avoided, as well as trouble to the mother and anxieties for her child, if this prenatal period could be spent under natural and wholesome conditions. We have scarcely begun to know much about maternal impressions, but they are of deeper influence and significance than can yet be explained. Hurtful impressions are thus transmitted beyond a doubt, and beneficient ones even more truly and constantly. It is conceded that the finest known specimens of children are found among the British nobility, and, as has been said elsewhere in this volume, our insular cousins are more enduring than we, certainly in physical competitions, as in long-distance running. The conditions of their early growth and development are hedged about with unusually wise safeguards. If, as has been objected by sentimental observers, these children see less of their parents than those of humbler folk, they are provided with the best possible substitutes in the way of caretakers and teachers. They are reared under the most perfect conditions as to surroundings, almost altogether in country places; whereas those children compelled to live with their parents—who, having a good many demands upon them, are unable to devote their best energies to the care and instruction of their offspring—are liable to grow up haphazard, and fall into many dangers, in spite of the best affection and intentions. Indeed, there is

a manifest peril for a child to be provided with too much or too solicitous affection from unwise parents, and although home influences are inestimable in the way of character growth, nevertheless the exigencies of modern life too often call away the best energies of the parents, and children come in for what is left.

A word may be said in passing of children who are backward mentally, a condition which frequently is only relative, being a state of instability of the nervous equilibrium, from which good or evil results may follow, depending upon the same conditions which help or prevent the growth of the nervous force in the body elsewhere. By far the most important considerations have to do with the acquirement of physical invigoration. If mental feebleness is once recognized, it is beyond measure important for the parents to seek skilful advice and to follow it closely. The education of the mind and of the body should go hand in hand, and all forced forms of mental training should be avoided. If the parent is able and willing to be the caretaker, and spend a good deal of time in the open air, especially the fields and barnyard, thus insidiously teaching and molding both mind and body, sharpening observation, and aiding in the formation of clear mental concepts, immense good can be accomplished, and, not seldom, the prevention of serious mental warping.

XIII

Development of Mind.—It is important that a few remarks be made here on the development of mind as tending to show the connection which the brain and its processes have with enfeebled bodies. We occasionally see precocious minds endowed with very feeble envelops. If such brains are overencouraged, they are capable of using up too readily what little residual vigor there is in the entire organism. Precocity is a manifest peril;[1] it is ever of doubtful value; the very abnormality is evidence which should put us on our guard, so that we should aid in preserving not only the organic activities and groundwork, but, above all, the integrity of the mind itself. Along with physical weakness there is inevitably a certain lack of mental vigor, and this must be particularly borne in mind, no matter how intelligent

[1] Precocity is a loss of balance between the bodily and mental growth of children in which one or the other element may predominate, but rarely both appear together. This state is scarcely one for parental gratulation, and always demands exceptional care to check on the exuberant hand and develop on the lacking side. It is seldom or never accompanied by intellectual balance. A capacity for sustained overaction, mental or physical, is unusual also, and in many ways such children are disturbing factors to their families and themselves, and usually come to ultimate grief. They need isolation and systematic physical development of a slow and quiet kind.

ht a child may seem to its admiring parents or worshiping rela-
s. Mental processes are purely the outcome of physical impulses,
there are in history conspicuous instances of great intelligence
ited out as existing in wretchedly undeveloped bodies; yet such are
ays open to question, and in the ordinary course of every-day life
certainly cannot assume that this unnatural juxtaposition is prob-
. Therefore it must be assumed from the outset that in a feeble
y the mind must be handled with unusual delicacy and judgment
nable it to develop according to its possibilities, no matter how
dly or hopefully we estimate these. At least, the regularity of the
mic activities must be fairly good to enable a structure of such
unding delicacy as the brain to grow naturally in size and power,
there must be maintained a very high order of cellular integrity
nable that organ to reach even a fair degree of energizing capacity
delicate differentiation. If this is true of early, budding infancy,
n the whole organism is incompletely differentiated, and until the
of early adolescence, when the brain reaches its normal bulk, it
ven more important that from that time on to maturity, which
bout the twenty-fifth year, every care be exercised to enable the
nal perfection to be reached.

Simple inductive reasoning from natural objects, of their quality,
ts, and means of growth, is the kind of teaching that should be
ued. The average teacher knows pitiably little about what the
d of man in this budding state is capable of doing. We would urge
l all who have any desire to know the truth to begin by learning
t the ordinary concepts of a young child are and how they shape
mselves, and how language, as ordinarily learned by him, so mis-
ing, is capable of conveying or distorting thought.

XIV

Feebleness in Girls About the Age of Puberty.—Girls who
me pallid and feeble about the time of puberty constitute a
e or less constantly recurring group of cases, and present them-
s with a series of symptoms indicating enfeeblement of mind and
, becoming lackluster, losing interest in life, and are a source of
ety to their parents. Too often this group of symptoms escapes
ition; a medical adviser trying, perhaps, several methods to relieve
failing, gives the time serving advice to allow this child to outgrow
difficulty. Of course, if any organic disturbance is detected; if there
ything obviously amiss in the digestion or elsewhere, and when

these difficulties are removed, then in the removing of that which is obvious other disordered states are helped, and final recovery, partial or complete, may be the result.

So long as girls are in the vegetative stage, with undeveloped sexual tendencies, while they romp and play as boys and girls should do, all goes well. The requirements of civilized society, which limit the too boisterous play of girls, causing this to stop or offering discouragement, inducing an early oversqueamishness about getting themselves dirty, or making more noise than custom encourages, taking more interest in the refinements of life than the essentials, gradually produce in girls approaching puberty an exaggerated sense of the importance of refined conduct. This is by no means confined to the wealthier class.

Very early the human female begins to suffer from slowly acting bowels; not only so, but unless the opportunity for evacuating these is hedged about with all kinds of artificial safeguards, any discouragement will result in neglect. Teachers in schools admit this when differences between boys and girls in this particular are pointed out.

An examination of the girl who seems to have lost her interest in life will usually reveal loss of appetite or overparticularity in choosing of foods, often some vitiation of tastes, lack of muscular capacity, perhaps some evidence of dyspnea on exertion, irregular or slow-acting bowels or recognizable failure in circulatory activities, especially clammy hands and feet, heaviness of breath, and if the lungs are examined, the apices are seen to be insufficiently expanded. The heart exhibits evidence of dilatation, or, at any rate, there is a flabbiness about it and a distance to its sounds, a heaving impulse, and the pulse becomes overreadily disturbed in rhythm upon motion or excitement.

The girl will be more inclined to read and employ herself in sedentary fashion, and will lack spontaneous activity and alertness. The blood, if examined, will be found defective in hemoglobin; the urine perhaps of high specific gravity, probably alkaline, or, it may be considerably increased in amount, or these conditions may alternate. The symptoms are vague enough to escape attention ordinarily, but prompt and persistent remedies are here of almost as much importance as in more seriously disturbed states.

Remedial measures are most important, lest worse things follow, and should be persistently employed for months rather than weeks, continued, it may be, for years. Nothing is of more importance that the physician shall gain the confidence of his patient and secure her cooperation. If she will be frank and candid in discussing ailments with him, he will very often find much that would otherwise

main obscure. There are numerous psychic conditions which de- and careful weighing—the doubts, the fears or ambitions, more ely a hypercritical self-examination; at any rate, an increased trospection, and not seldom a rather interesting and original con- ption or expression of views on life which will amuse and instruct the vestigator.

The chief difficulties and needs have to do with the question of pplying incentive, the devising how to secure an increased interest in e in its wholesomer aspects. Lack of incentive is the greatest stum- ing-block in dealing with apathetic folk, whether children or adults, d here the personal factor, the force and individuality of the physi- n, comes in most strongly, and some men can infuse a greater degree enthusiasm into their patients than others.

XV

As to how we shall accomplish initial movements, an awakening of erest and invigoration of the will, few rules can be outlined or de- d. It is a good plan, however, to strive earnestly to impress, not y the necessity of doing as we direct, but to urge this with such sub- y and tact and, withal, extreme persistence and variety in our thods, that the results may be surely obtained soon or late. Flattery an important agent, stirring the vanity which every one possesses, should possess, and it is perhaps nowhere more influential than in aling with girls, for the key-note of success lies here. Of course, it mpossible to expect much success in shaping or directing forces until re is enough of inherent vigor present to warrant activities, whether the mind or body.

The first organ to be looked to is the heart, not neglecting, of course, digestive conditions. A powerful heart tonic used for a few days weeks will help more than any other one medicine. So soon as we secure a full, regular, strong pulse, and one which is not subject nore than the normal variations from lying, sitting, or standing, and ft movements, we have the most important point gained. The ount and character of the animation are fair indications of the fulness of our heart tonics; the urination is also a helpful index.

The digestion requires assistance. The bowels must be kept suf- ently active. The food should be supplied in adequate amount, ig exact measurements, and had better be highly albuminous, at st for a time. There is usually little appetite for meat, and often olt at milk. Regulated amounts of broiled or scraped beef or mut-

ton, along with predigested or lactacid milk will soon show results. Most cases of anemias in this class, as well as in younger children, are due to faults in the intestinal digestion.

XVI

Many girls get into the luxurious habit of sponging themselves piecemeal, in driblets of lukewarm water, or taking a warm or hot bath, which they declare is a great comfort and pleasure. It is not wise to insist on a cold bath at once, but this can be accomplished by the help of a competent trained assistant or a good nurse or maid. The use of cold-water sponging or bathing should be learned and practised. A good way to begin is this: Let the patient stand in about three inches of warm water; get a maid to sponge her off in a little of this, immediately following with a larger sponge, rapidly over the surface with cool salt water, growing colder each day until it is quite as cold as the room in which she stands, or more so; follow immediately by a brisk rub-down, until the skin acquires a prompt reaction, and there comes a clear pink color from head to heel. This bath, in the event of marked weakness or if it be followed by exhaustion, is better given after a partial breakfast, such as a cup of cocoa, and followed by rest in bed for half an hour, then the bath given by a maid, a rough rub-down follows, and, finally, breakfast. As the girl grows stronger she will take her cold bath herself and learn to enjoy it. It is valuable also, after some regular outing or exercise, to take another salt sponging, not so thorough, perhaps, or a brisk rub-down, and a rest, lying down from half to an hour, say, until the end of the afternoon and until the evening meal is ready.

The kind of exercise suitable to such cases is too large a subject to discuss in full. One thing is manifest: habitual inaction reacts upon the heart, increasing its feebleness, from whatsoever cause they may have come. A slowly and carefully increased exercise, not too monotonous, along with vigorous tonic medication, will repair the fountains of motor force.

The lungs will usually be found insufficiently expanded, at the apex especially, and respiratory gymnastics are indicated if some one can be found to direct them properly, and this the physician himself should supervise. Forced deep breathing, with a few forced stretchings of the arms, twice or thrice a day, will accomplish needed expansion and greatly aid in oxygenating the blood. The use of medicated

ions is helpful, or the use of whatever agencies will produce a deep, espiratory action. At first the patient will complain that it makes lizzy, and, being more or less apprehensive about her physical , she will object. So soon as she can be induced to take mild -air exercise (of which walking solemnly along the street is em- ically not the best), she had best be encouraged to do so. The lled calisthenic exercises, which mean "beautiful forcefulness," ably because they are usually so hideous, are devoid of interest not particularly useful. Only that exercise is suitable which in- s some pleased acquiescence in the performer or some interest he doing. Fancy dancing, as previously remarked, admirably lops loins and back.

Tennis is also excellent, but too violent for girls below par, and inly until the patient gets into a moderately good condition. Golf e of the best possible exercises and is to be highly and persistently nmended. It can be played at any time, for any length of time, e or in company. A giant may play even with a dwarf by handi- ing. Swimming at the seashore or elsewhere is of admir- efficacy. Rowing gently in a skiff; the old-fashioned game of uet, unfortunately now out of fashion; the excellent and ancient e of graces, which really was more or less graceful; and that obso- game known as battledore and shuttlecock—all have merit. hose who can afford it, or in whom it is warranted, it is certainly to prescribe and supervise a course of massage and regulated ex- es in the form of specially prescribed movements; but the discussion has rather to do with cases who do not care to be considered invalids, one the less require the full attention of physician and parent.

XVII

Girls who go to school are the victims in these days of vaguely de- forms of exercise called "physical culture," usually demonstrated ne of the least busy of the teachers, who tells them to stand up and their arms to a one, two, three order, and the uninterested girls nt, under these circumstances, acquire a most listless, imbecile ession. But this is better than nothing—better by far than sitting ly stagnating—and may serve a more or less useful turn. Under direction of a qualified teacher posing, stretching, bending, and on exercises are of incalculable value. If, however, the time so were employed in tossing back and forth a good old-fashioned -bag from one to another, or that most useful of exercises, the

directed to her pelvic organs, her mind becomes infected with a m of disease which may, and too often does, warp her life and that all those in her immediate environment.

HINTS AND WARNINGS IN BRINGING UP INFANTS AND CHILDREN

I

All parents cherish ideals to which they wish their children to nform; some are wise, some foolish and all are vague. Better results uld follow an agreement as to a group of qualifications the desira- ity of which could be accepted by all. Each could then exercise the erty of specializing safely according to his own taste, training and quired beliefs.

We can all agree in the wish to bring up our children as good men d women; in the purpose to make them good citizens, devoted body d soul to the best interests of social welfare; men and women having heart the best interests of their fellow men, the nation, the race.

"The purpose of a liberal education is, as the Scriptures put it, ave the eyes opened, to be free from all delusions, illusions and the a Morgana of life.

"A liberal education liberates us from subjection to superstitions, rs; delivers us from the narrow bonds of prejudice, from enslave- nt to all degrading influences. It is not to live in a fools' para- e, or to go through the world in a post-hypnotic state of negative lucinations.

"Open the eyes of the young so that they shall see, understand d face courageously the evils of life.

"In every young child there is a wealth of latent power, hidden asure, inaccessible till brought to the surface by experienced, solici- s parents, teachers and mental experts. Too much thinking or rstudy does not cause nervous or mental breakdown or disease. ese are produced by hereditary arrests or defects, aggravated by rry, emotional overflows, irritations, absence of right guidance in iefs or conduct. Watch for manifestations of progress and set the ld's feet on the right road; encourage, explain, persuade, cultivate critical faculties, the judgment. Teach to differentiate between od and evil, the desirable and the undesirable; guard against evil rs, superstitions, morbid prejudices and above all, credulity" (Boris is).

Teach facility of awakening in oneself, while under education,

Approbation for initiative, rewards for courageous acts, should be liberally supplied. By such means the weakest often become the strongest and most efficient. Above all, teach the principle of common-sense views of actualities; inculcate a sense of proportion in all things. Provide abundant outlets for the inborn spirit of adventure which is the great school of character. The pioneer spirit, the war and chase appetites, are either exercised freely, or illicitly, or they are suppressed, thereby making for incompleteness, mental dishonesty, confusion, volitional enfeeblement.

Choice of action, determination, will, can all be readily cultivated as well as memory. The will is not so much a fountain of force, of dynamics, as it is an instrument to apply the force, the tool-holder of the lathe, to put the power where and when it is wanted. We increase our capacity by using it more and more accurately, and to the limit, in any given direction.

Moods, caprice, when exhibited, should be replaced by conservative lines of effort, in forming and executing definite resolutions. A calm disregard of an outbreak is the best attitude to assume to check its flow. Sympathy and taking sides is fatal. Too much tenderness is the greatest error to commit with a child of insecure nervous balance.

III

Teach the meaning of life, which is a steady progress in character growth, a forming and helping oneself and even more in forming and helping others. We gain power, we "acquire merit," by bringing out our stored-up reserves of energy and applying them to steps of progress.

Sex impulse dominates every man and woman, hence also the world, in many essential directions. The sooner the child learns the truth about sex, its power, its limitations, its needs, and its non-needs, by so much will one of the gravest perils be reduced to determinable proportions. Principles of sex are best taught by inculcating principles of biology; these are readily made applicable in confidential chats by parents or teachers.

Some of the most obstinate psychopathies arise from sex impulses suppressed or indulged, interpreted wrongly, inducing shame, fear, confusion, introspection, hence confusion.

The highest character is one so confident of well balanced powers as to feel willing and generous in helping others; one who sacrifices self, ease, desires; is able cheerfully to work and wait, to fight, to fall, to rise and fight again, and never to know when overcome.

Fatigue states, insufficient oxidation, intestinal irritation, frequently occur, are readily overlooked, and are accompanied by a state of nerve-insufficiency which is at the root of many psychic perturbations. These constitute mere exaggerations of inherent tendencies of character, whether normal or morbid.

"The essence of prevention of nervous disturbance is to associate useful activities with agreeable feeling tones, and to dissociate from useless or injurious acts the agreeable feeling tones that may have been acquired. . . . .

"The interest sentiment is an essential of all psychology, as well as of effective pedagogy. Quietly substitute a new interest sentiment for a disagreeable former one, and the feelings are changed by distraction and substitution. . . . .

"Those who do not depend on reason must *grow* into feeling by accustomedness, by reiteration, to force into the unreasoning affectivity a realization . . . . . this is the method of pertinacity" (Tom A. Williams).

Discourage too great a desire for approbation in little things as well as big; it distracts attention from desirable objects, is often dangerous as well as disturbing to progress.

Normal habitudes are essential; habits of orderliness and precision are to be inculcated, yet not enforced too dominantly, or they may become pernicious. While cultivating variability beware of demanding or enforcing markedly unusual things, it upsets the child's whole world of fitness.

In brief, a wise parent may not need to search the teachings of psychologists to learn how to bring up a child. A man may not need to know the science of law or economics to undertake large ventures. No end of blunders are saved, however, to the man who knows the rules of any game before assuming such responsibility as conducting his own child in the big game of life.

STRUCTURAL EVOLUTION IN NORMAL INFANTS AND CHILDREN

Physiologic and Anatomic Memoranda

I

Age and Variations in Age.—Findings based upon tests applied to growth of both mind and body.

A child is as old as the period of time it has existed since birth,

easured in hours, days, years, or fractions thereof, in the estimate of he law.

Age should be determined by the physician, teacher, or employer f labor, not only in terms of chronology, but also in those of growth, levelopment, evidences of advancing maturity in mind and body. Hence it is becoming customary to estimate age (in the light of recent iologic and psychologic investigation) with reference to growth of nind, functional capacities, anatomic and structural evolution.

Progress in nutrition in infants is readily determined by measuring ncrements or retardations in height; increments or losses in weight, n girth of chest, of limbs; the biochemistry of the urine, feces and the ke.

Mental and physical differentiations in age have as yet only proceeded sufficiently to demonstrate certain highly significant facts. When they have reached a point where exact tests can be uniformly nd extensively applied, a marked step forward will have been made n our understanding of a large number of practical problems in uman conservation.

Children brought up under almost precisely the same environment, ubjected to similar conditions, are well known to differ more or less efinitely in the rate, character and completeness of advance; also ndependently of the effect of any accidental agencies for stimulation retardation. Differences consist in variations in the inherent ctors of growth exerted upon similar yet varying growth forces values. Some directions or features of growth progress more pidly, others more slowly, others again maintaining a rate in accord th established averages.

Hence some children conform, as nearly as can be determined, their chronologic age in mental and physical correspondences, to norm of their family, their race, locality and other conditions of vironment; while others will exhibit more or less pronounced differces in one particular or another. These divergencies it may be necesry to determine with precision, so that decisions can be formed as to number of points bearing upon health or unhealth, mental or physical ucation or the adaptability of the individual to such changed or anging conditions as may come under consideration.

II

Mental or psychologic age is determined by applying formal tests overing the principal mental processes, such as perception, imitation,

second only in significance to the event of birth, the child commences a period which can only be likened to an explosion of growth and development. He begins to grow tall with great rapidity, weight is added pound by pound, and with the increased bulk comes a rapid addition to the muscle, strength and motor ability. This age is most prone to begin during the warm months of summer, and when it does occur, a single month may add an inch in height, twenty pounds in weight and double the muscular force. After a variable length of time, a year or a year and a half, the increase in height, weight and strength gradually returns to a slower rate and the body and mind proceed with a stage of ripening which we call adolescence.

"Referring to the whole progress from birth to maturity, we can catalog the appearance of each new added structure, function and mental ability, the whole forming a complete series from start to finish. Nor need we end our catalog with maturity, for even on this high plateau appear new physical features and mental traits which determine important epochs in human life; even after this the downward slope of existence shows salient points such as menopause, canites, and tissue hardening which mark physiologic stages of exceeding definiteness and importance.

"In this catalog of events physiologic and mental growth do not proceed in an orderly fashion year by year. Some may be hurried, others retarded. Individuals rush past others for a time and then lag behind. Whole nations seem to develop rapidly up to a certain point and then fall back behind others of steadier growth . . . . . the general error of science, medicine and education is a blind adherence to a chronologic age" (C. Ward Crampton, *op. cit.*).

Anatomic age is based upon correlation between epiphyseal growth and general development. Growth in the structures of the joints is claimed by T. Morgan Rotch to exert a certain bearing, almost of correlation, on mental growth. This leads up to the idea that, in grading individuals from birth to completion of development, the epiphyseal development should play a prominent part and should replace chronologic grading; also that the child's general welfare depends to a certain extent on keeping the mental and epiphyseal development in equilibrium, thus avoiding overstrain both mental and physical.

I

Development of the Mind.—That the mind develops slowly, expanding gradually till the zenith of intellectual power is reached, and

described as almost the only equipment beyond the mere physiological working of its various organs. But at one month we find that this uninformed baby has made a series of important discoveries. It has learned that there are sensations, that they are interesting; it will attend to them. You know how a baby of one month will stare; the eyes will be fastened upon some bright and interesting object. At the end of a month the baby shows evidences of having ideas and bringing them into correlation—association—because already after one month, when held in the proper position in the arms, it shows that it expects to be fed. There is, then, already evidence and trace of memory. At two months much more has been achieved. The baby evidently learns to expect things. It expects to be fed at certain times; it has made the great discovery of the existence of time, of the existence of space, for it will follow to some extent a bright light; it will hold its head in a certain position to catch a sound apparently from one side; or to see in a certain direction. The sense of space and time in the baby's mind is, of course, very imperfect at this time, but those two non-stuff realities about which the metaphysicians discuss so much, the two realities of existence which are not material, the baby at this time has discovered. Perhaps, had some great and wonderfully endowed person existed who preserved the memory of his own psychological history, of his development during babyhood, we should have been spared the gigantic efforts of the metaphysicians to explain how the notions of space and time arose. Without knowing how, the baby has acquired them, and has already become a rudimentary metaphysician. We see, also, at the end of the third month, that the baby has made another remarkable discovery. It has found not merely that its muscles will contract and jerk and throw its parts about, which surely was earlier a great delight to it; but that the muscles can contract in such a way that the movement will be directed; there is a coordination of the muscular movements."

"Such is the mere life of vegetation the baby lived during the first two months; no grown person ever experienced such an expansion of life—such a progress from power to power in that length of time." (Says M. W. Shinn, *The Biography of a Baby.*) . . . . "The baby in two months has accomplished an amount of development which no adult is capable of. And now at three months we find another great discovery made by the baby that it is possible to bring the sensations which it receives into combination with the movements which it makes. It learns to coordinate its sensory impressions and its motor responses. We hardly realize what a great rôle this adjustment, between what our

Not very much; we always use these things which we learn in the first six months, as the foundation of all our thought. By eight months, the baby is upon the full career of experiment and observation. Everything with which the baby comes in contact interests him. He looks at it, seizes hold of it, tries to pull it to pieces, studies its texture, its tensile strength, and every other quality it possesses. Not satisfied with that, he will turn and apply his tongue to it, putting it in his mouth for the purpose of finding out if it has any taste. In doing this, hour after hour, with unceasing zeal, never interrupted diligence, he rapidly gets acquainted with the world in which he is placed. At the same time he is making further experiments with his own body. He begins to tumble about; perhaps learns that it is possible to get from one place to another by rolling or creeping, and slowly he discovers the possibility of locomotion, which you know by the end of the year will have so far perfected itself that usually at twelve months the baby can walk. During this period of from five months to twelve the baby is engaged upon a career of original research, unaided by anybody else, getting doubtless a little help, and, of course, a great deal of protection, but really working chiefly by himself. How wonderful it all is! Is any one of us capable of beginning at the moment we wake to carry on a new line of thought, a new series of studies, and to keep it up full swing, with unabated pace, all day long till we drop asleep? Every baby does that every day.

"'When we turn to the child who goes to school, behold how much that child has lost. It has difficulties with learning the alphabet. It struggles slowly through the Latin grammar, painfully with the subject of geometry, and the older it gets the more difficult becomes the achievement of its study. The power of rapid learning, which the baby has, is clearly already lessened."

III

The view that the largest potentialities reside in the infantile and childish mind is strengthened by the findings and opinions of Professor Boris Sidis, whose teachings on the subject of educational psychology are original, convincing and of proven efficacy. With the late Professor William James, he was the co-discoverer of the law of latent energy; he is convinced that most of us "live unnecessarily near the surface," and throws the blame for this largely on our educational systems. He particularly condemns the custom of delaying any attempt at formal training for the child until he arrives at what is called the "School age."

"The notion that the young child's mind should be allowed to lie fallow is utterly wrong and pernicious. The child is essentially a thinking animal. No power on earth can keep him from thinking; from using his mind. From the moment his inquiring mind first takes in the details of his surroundings he begins the mental processes which education is intended to guide and develop. He observes, he draws inferences from everything he sees and hears, he seeks to give expression to his thoughts.

"Left to himself, however, he is certain to observe inaccurately and to make many erroneous inferences. Unlesss he is taught how to think he is sure to think incorrectly, and to acquire wrong thought habits, causing him to form bad judgements respecting matters not only vital to his own welfare but also important to the welfare of society. In fact, in order to get the best results, his training in the principles of correct thinking should begin as soon as, or even before, he starts to talk. There need be no fear of overtaxing his mind. On the contrary, the effect will be to develop and strengthen it, by accustoming him to make habitual use of the latent energy which most people never use at all."

Here we have set forth convincingly the great principle of *Conservation versus Prodigality*, or wastefulness of budding power.

Professor Sidis would rely on the educational principle of teaching a child through appealing to his interest, by systematically applying the powerful but little understood psychologic factor of suggestion, the intrusion of an idea into the mind with tact, skill and power, so that it dominates and for the moment disarms or excludes all other ideas which might interfere with its comprehension; by implanting in the mind ideas which one wishes to render dominant; by arousing curiosity and sustaining interest. This principle can be carried out also through play, games, songs, as exemplified by the kindergarten. Professor Sidis is of the opinion that this may be extended advantageously to subjects far beyond the kindergarten range and the child led to undertake and pursue any line of study, if only it is made sufficiently absorbing.

Also it is entirely practicable to stimulate the child to undertake lines of study to which at first was shown indifference or positive dislike till the principles can be mastered with ease and the subjects finally continued with enthusiasm. Everything about us is of suggestive value and can be so directed and controlled as to prove of large educational utility.

Everything a child sees or hears, whether he is consciously aware of it or not, leaves a more or less profound impression, is subconsciously

mbered and may at times exercise a determining influence upon
'hole course of life.

he method of training the blind and deaf girl Helen Keller was
similar lines. She was able to learn music by placing her hand
piano and receiving its vibrations. She was thus able to recognize
ecall by name music not heard by her since her nineteenth month,
e losing her hearing.

'he environment can be so arranged as to cause it to radiate
a child suggestions which shall quicken and enlarge intellectual
cities.

IV

1 education one basic principle must govern. The child is far
mpressed by specific guidance or instruction than by unconscious
ption. Didactic teachings make little impression, whereas
ple is all-forceful. When able to read, only partial, fragmentary
epts are formed by interpretations from visualization of printed
s. "The child does generally as he sees others do, sometimes
is bidden, very rarely as he is taught." (Professor John M. Tyler,
iology, Amherst.) Pangs of pain from eating green fruit are re-
bered and become part of unconscious selection as no preaching
ever be. The same principles of learning essential things can
n throughout school, college and after-life.

Woe betide the child who is brought up according to the parent's
rstanding of the best, wisest, most sensible and clearly written
s. . . . . From this soil have sprung up countless fads, varie-
nd vexations to spirit and body of the child." (Professor Tyler,
t.)

1 the domain of conduct we seldom pay attention to principles
e suffer from experiences bringing sharply to our consciousness
eed for modifications of impulse. Emerson believed the way to
was by emphasizing the salient points by concrete instances and
ingly worded phrases, rather than by logical agreements.

n short, in the best interests of the expanding mind, the child
most, whether of good or of evil, from his domestic environment,
nconsciously exerted impressments of the home atmosphere.

n thus estimating the power of a child to react to influences of
onment we must take into careful consideration his resistancies
ell as his acceptances, *i.e.*, his reactions. Employing biologic
gies again, "Living beings, while necessarily obedient to the larger

ciples of genetics. When a child becomes in turn a parent, he or will unconsciously utilize the elementary principles learned from the lution of the growing plant or animal; will develop the same kind of iking, feeling, willing and doing, the qualities of patience and fidelity, ch he learned of the plant, the chick, the puppy.

Hence the farm again stands as the normal and most desirable place learn the real lessons of life. No school can compare with it; no cher can come into competition with this untrammeled supplier of se impressions, these incomparable opportunities to see, feel, realize, evolution of primitive phenomena of growth and change. A child red in the country is by that one fact the superior in fundamental tors of knowledge; is the richer for all time in possession of the ma- ials out of which future standards of conduct, of judgment, of beauty, lofty purpose, are compounded. From these simple, natural sense cepts come the elements of science, of wisdom, of character. Other igs may pass away, but sensory images remain to delight, to be eled in, to comfort, as age slowly draws the veil over dimming vers.

VI

Genesis of Language.—Language is much more than speech, it is integral part of expression. Defects of mutual comprehension are less to faults of expression in the infant than to those of apprehen- i or appreciation in the parent. The impulse of the baby to convey ining may be plain enough; it remains for the parent or nurse to sp and to interpret the thought and purpose conceived.

In interpreting a primitive language the parent should give un- ded attention to understanding the meanings or intentions which emphatically enough conceived, however imperfectly conveyed.

Every organic stimulus tends to give rise to movement. The infant uires percepts through the medium of the senses, which in turn, give to rudimentary ideas, struggling for expression as the machinery of ech begins to adjust itself for utterance. Dormant motor cells ke to action. Motion tends to larger, clearer, more specialized , taking shape in gestures, in combinations of movement leading anguage.

Doubtless, when we become wise enough to perceive and interpret various factors of human expression, there will be made plain many reciable evidences of intention which will prove readily intelligible can be reduced to exact formulation. This is now being done by chologists in the study of monkeys and other animals.

A watchful, loving mother's consciousness becomes instinctively aware of meanings in a multitude of indications designed by the infant to convey its inchoate but often vitally important intentions and desires. In short, she becomes aware of and learns what the baby wishes her to know.

Meanwhile, the baby, who is often vastly more intelligent than we usually give him credit for, soon forms pretty definite ideas of what he wishes to have known. Delightful and wonderful are the steps of progress he makes to take the mother into his confidence, to persuade her to do or not to do, as he wishes. The voluntary attempts at articulate speech are thus begun, by cooing, gurgling and the like.

Poets often contribute to the formation of thought by jingling phrases which unfortunately slide sometimes into the mind as truths. When Tennyson tells us of "an infant crying for the light, an infant crying in the night, and with no language but a cry," it is plain he was neither a mother nor a physician; though he, as well as other poets, is (often erroneously) credited with being a psychologist.

To be sure, the noisiest item of primitive language is the cry, and it is full of meaning to one who is divinely gifted with wise comprehension. This most mothers are, or all could be, if they gave the matter adequate attention and reflection.

VII

Infantile cries may be divided into shouts, yells, screams, roars, whimpers, whines, wails, bawls, squeals, screeches, squeaks; cries of older children may include these and also whoops, snarls, grunts, snores, wheezes, sibilations, pipings and likewise simulations of animal cries. All these words contain a certain amount of expressiveness. Moreover, the infant aims to convey his meaning both definitely and forcefully.

Infantile cries contain a significance which a hard-hearted critical neighbor, or bachelor uncle, fails to appreciate. Few mothers (who deserve the title) are at a loss to interpret them aright, soon or late. Physicians need to understand the variations in cries, for the reason that certain of them are indications of definite disorders.

The cry of discomfort is a pitiful wail, not so feeble as the cry of fretfulness, nor so emphatic as that of pain. The first cry after birth is one of natural discomfort on being removed from a uniform temperature of 98.4 degrees F. to one usually much colder; to a medium (the air) much harsher and unusual to the skin, coming in contact with coarse materials, cloths, the physician's clumsy fingers, etc. Also it

ue to a normal spinal and lung reflex of contraction; the muscles he chest are likewise caused to grow tense and the air is expelled efully through the vocal cords, which share in the tension.

The cry of hunger is another spinal reflex and resembles that of omfort, with the addition of a crescendo of impatience, and will n cease at the appearance of food or its container.

A vague feeling of miserableness, depression, induced by disorder isease, is voiced by a fretful wail or whimper, is plaintive, somewhat il.

The cry of pain is a loud yell, roar or scream, is usually short and rp, and in children of over three months may be accompanied by s; the stronger the cry, the severer the pain indicated. Colic is a mon cause, pins, creases in the clothing, or other hurtful agency.

A cry suddenly stopped, with repetitions and abrupt cessations or kings, usually indicates disease of the lung or pleura.

If the infant cries as though in pain and puts its hand to its ear, sus- on should be directed to disease of the ear.

Hoarse, "croupy" cries indicate disorder in the vocal cords.

The cry of fright is obvious enough, an agitated, sharp scream, a cing whimper.

No child cries without a good cause; it is the duty of the mother to her attention carefully and searchingly to interpret the various fac- of expression.

It is obvious to the simplest intelligence that to punish an infant hild for crying is barbarous and cruel, an act for which a mother urse should be plainly reprimanded. To coddle, to display an ss of tenderness is equally reprehensible.

When speech begins to evolve there is great need to guide enuncia- along desirable channels of precision in pronunciation, intonation, ice of words, the exact meanings of words, and formation of sen- es. Bad habits in enunciation formed in childhood tend to become l and sometimes ineradicable. Good habits of speech early estab- d make for rapid, economic advancement in intelligence, in in- gibility, in educability, in charm and efficiency.

THE SENSES, PERCEPTION, FEELINGS, EMOTIONS, SENSORY TRAINING

I

A normal infant is equipped with boundless capabilities, which ld develop anywhere, if supplied with entirely favorable environ-

issolubly bound up in that of the other. The foundation, then, erviceable living is the perfection of latent capabilities.

III

Certain facts concerning the workings of the laws of mind must be lized by parents, teachers and all who exercise control over children. ly the merest sketch of these facts and principles, partial and fragntary, can be presented here. The most that can be attempted is all attention to them by inference and appeal.

The most wise and advanced psychologists have demonstrated much, that in dealing with the problems of education, adjusting human creature to its complex and confusing environment, in pting measures to enhance and safeguard the budding faculties n evil influences from within or without, and in overcoming limitas, one golden rule must be observed: Adhere to simplest, most monsense methods of interpretation, explanation, suggestion and suasion. Keep clear of preconceived notions. Above all, shun sticism,' symbols, shibbopeths, philistinisms—for that way lies fusion, misapprehension, ineradicable damagement.

When we meet those admirable individuals, arising in the simplest ies, of sane, wholesome, well-balanced mentality, exerting a force ny community, the explanation is that such a person was blest a good mother, a wise, simple-minded woman, whose maternal incts to do, or to let alone, to encourage, to interpret, to suggest, e sound and competent.

Great men and splendid women have, since the dawn of history, rged from time to time from widely divergent homes, from antial planes of culture and religious belief. The explanation of the esses by which these personalities have evolved will, in the final at, be found to lie in the conservation of latent energies by a mother nely endowed with robust common sense.

We would advise those who desire to know how best to conserve enhance the infantile and childish mind, to inform themselves the normal processes, laws, variants, of the brain and central ous system, and to become founded in the principles of sensory motor training.

IV

No one of the senses can be neglected. Some are responsive to ulation more from one source, some from another. In obtaining nary percepts the eye may come first, the ear second, with touch

and taste second to neither. Yet sometimes the eye can see plainly while the consciousness cannot interpret until reinforced by the ear, or touch, or odor, or taste.

"For untold barbaric ages, man has attained through the medium of the ear almost all the knowledge that came to him at second hand . . . . many visualists can construct a more vivid picture if the elements are given them through the ear rather than through the eye" (R. P. Halleck).

The brain is subject to modification by each of the senses. Youthful nerve-cells are easily modified by training, but older ones increasingly less so. It is always too late to be what you might have been. The plasticity of nerve-cells is inversely proportionate to their age.

No one can ever become an approximation of what he was capable of being, unless the best sensory and motor training has been supplied in early life and was thorough in fundamentals.

"The normal man is one who can form definite images from all the senses; who can recall almost equally well the odor, color and touch of a rose, the taste of a whipped custard as well as the sound made in beating it" (Binet).

Master minds are exhibits of capacity to perceive from diverse sources, more especially from some, and to interpret clearly and forcefully those percepts which attract them most keenly. Moreover, the chief store of percepts must be laid up in childhood—all later ones are inaccurate, unclear, not fit to pass on to others till revised.

Hence the first and greatest educator is Nature; the best teaching principle is to encourage observation of natural phenomena. Without a solid foundation here, all later deductions of art, science or philosophy are not to be depended on, or accepted. Interpretation, moreover, is of equal import with observation. "Eyes and No Eyes" must be supplemented by sound deduction, intelligent inference and construction.

V

Feeling, Emotion

The emotions play a master rôle in the evolution of the conscious life of infants and children. The complex of agreeable and disagreeable states of any complete mental state we may call an emotion.

Feeling is the simple agreeable or disagreeable side of any mental activity; is a pure, primitive mental state, just as is a sensation. We begin to feel when we begin to live. An emotion, like a perception is a more complete mental state, presupposes a representative idea to

de or prolong it. By a combination of feeling-tones is emotion built . Stimulation through the sense organs reacts upon the body, pro-cing ideas which in turn give rise to emotions. These, again, induce ntal complexes and motor acts. We read the play of emotions on the countenance and in the motions, in short, the expression. ie sensational factor induces states of knowledge; that of feeling leads emotion. Feelings vary in quality, in intensity, and in accord with anging bodily states or ideas, and are reversible. If the emotions e controllable the organization is sound, if they overflow readily and cessively, the neurotic balance is unstable. If a thing touches our elings it is able to interest us; if not, it is unheeded. The elevating notions are constructive; they aid in our achieving efficiency, variety, arm, contentment. The depressing emotions, if long continued, are maging, destructive, lead to dissatisfaction, despair.

VI

Primitive feelings induce primitive emotions. In the infant these both extremely simple, yet grow rapidly more and more complex, influenced by changing environment and multiplying experiences. The elevating emotions, such as affection, should be encouraged; depressing emotions, such as fear, self-pity, should be discouraged, ressed, or preferably, diverted and substituted by other and better s.

All emotions deepen by repetition, and fade away by diverting of ention or by judicious suppression. Clear standards of conduct uld be formulated and applied by parents, from earliest manifes-ions of emotion. The method of procedure is by judicious encour-ement of right feelings and emotions, and a firm discouragement of r, anger, discontent, etc.

One object should never be lost sight of for a moment: the achieve-nt of self-control. Upon self-control depends often the safety of the ly, the mind or the career. "Refuse to express a passion and it s." A cheerful air assumed will react upon the feelings and produce ual happiness.

Unstable minds and nervous systems are evidenced by emotional im-lance. To deal with this emotional disequilibrium requires whole-ne appreciation of the facts, the use of commonsense methods, and astly fortified by a fair knowledge of the laws of mental procedures, rmal and morbid.

Rewards and punishments must be absolutely just. Not only is

the child seriously damaged by displays of unreasonableness or fretfulness in the parent, but he is often an unerring judge of adult conduct and fitness for authority. Parental influences are readily jeopardized, often irretrievably lost, by exhibitions of incompetence or loss of poise through acts of hasty folly.

VII

Alert perceptive faculties are required to gain success and happiness. The conscious life of the young is made up of percepts, things perceived through the senses. Hence the need for normality in the sensory domain, integrity of the avenues of sensation, and for abundant and varied opportunities for acquiring experiences. Youth is preeminently the time for cultivation of the faculties; after twenty years this is scarcely possible. No life can be as full or complete as it should be which has not been provided with plentiful occasions to drink in wholesome and other impressions. The best groundwork for achieving fundamental impressions is to live in the simpler surroundings of the country, among the ever-changing aspects of nature, unmarred by limitations and confusions induced by civilization, sophistication.

> "And Nature, the good old nurse.
> Took the child upon her knee,
> Saying, 'Here is a story book
> The Father has written for thee.'"
>
> (Longfellow's Appreciation of Agassiz.)

All great men are equipped with keen perceptive faculties; provided with a large fund of sense-impressions. The whole store must be laid up in childhood and youth, elaborated by trained habits of clear observation and intelligent interpretation.

Attention must be cultivated, concentration of the mind on sense-perceptions; hence follows deduction from what is perceived by association of the elements of a concept, then conclusions are reached. Memory comes by use, by bringing the impressions, percepts, up to the consciousness. Hence by comparisons and associations arise ideas or images.

VIII

Self-consciousness is different from consciousness. It involves a realization of who and what we are, as contrasted with a consciousness of the things which are around us, wherefrom influences come to us,

ırough the senses and how they affect us, our consciousness. Self-ɔnsciousness may readily become exaggerated; one's own hopes, :ars, mental pictures of other people and things, are distinct only when 'ell directed, unconfused. The moment one becomes hypercon-:ious of oneself and refers external happenings to one's own personality, istorted images will arise, disproportionate relationships, misinter-retations.

The power of decision must be acquired early. Deliberation is ceded for the hair-trigger type, but most children need urging to make rompt, reliable decisions, by which they can abide.

A child needs plenty of varied experience, especially with other hildren. Protection from emotional irritation may go too far. Hot :mper is bad, but not so bad as nursing a grouch, which may grow ıto persecutory ideas or paranoid states.

The attitude of the mind is subjective when taking notice of itself; objective when observing the things about us. Mental objects can e known by no sensory mediation; there is no touch, no sound, no ıste, no odor, whereby we formulate mental objects in thought. The ody, with its workings, has no part in consciousness, except to be a asis or container of vital processes.

Definitions are impossible except as pictures, symbols. We are ware of streams of ideas, of impulses, of feelings, by introspection. 'e can observe how they are related to us and each other and to things ıtside; we can connote combinations, formulate laws. A mental ob-ct can be arranged, even completed, wholly within the consciousness, hich can then, by will power, be projected outward. Motor power ıd machinery can thereupon be employed and the object realized. ɔr example, we can form a picture in the mind and by volition, and ' means of our hand, paints and canvas, make the conceived picture ı actuality.

Enough has been indicated to show how plain and simple in essence e the processes of the childish mind and how efficient they can be made become through right opportunities, right guidance and judicious ıltivation. A child can do a great deal of thinking without guidance, only the conditions for cultivation of the sense-perceptions are ovided.

To enter more elaborately into the introspective domain of ;ychology, the intellectual, moral and volitional processes, would :cupy too much space, and they can be learned from any one many excellent sources, the best of which is a good teacher of ;ychology.

ence, energy, vigor, effectiveness; thus also come before one is aware it, capacity for self-control, for caution, for responsibilities. Liberty of course, not license. Inclinations are right and should be followed far as is possible or permissible, compatible with safety to self and the mmon good. Compulsion to do that which is not desired is hurtful. ; reason grows direction will be welcomed, persuasion readily prents any objectionable acts, and inhibitory capacities will gradually velop.

Unfortunately, children are compelled to adapt themselves to diveries in environment which, in comparison to that of most domestic anials, is profoundly to their disadvantage. Not many human mothers e supplied with reliable instincts and solicitudes.

II

The exigencies of city life tend overwhelmingly to vitiate primitive pulses, to subordinate such desires and capacities as make for delopment of the home; to change the nest or the hearthstone into mere abiding-place, whence the least as well as the greatest must re forth to earn money. The best education is supplied in an ideal me, on howsoever humble a basis, as that of the pioneer, the outor laborer, the small farmer. Here there is a constant supply normal stimuli to action, made convenient and necessary by commul interests. Each one, to the youngest child, is called upon to do ch things as lie within its capabilities, thus contributing proportiony to the common welfare. This, in its better aspects, cannot be passed as an educative groundwork. The poorer city dweller, subting on ready-made foods and with no outdoors but the street, finds scope for the primitive actions of digging, chopping wood, carrying ter, hence cannot develop symmetrically. Even among the well-to-things are little better. The street, with its many perils from "devilgons," trolley cars, etc., is becoming more and more unfit for a playound. The schoolhouse yards or roofs sometimes provide space erein the scholars can give vent to motor impulses, but at best these e wholly inadequate. Even the very rich city dweller is poor in ortunities compared with the country child, who has access to a bit woodland and a farm-yard.

All children, especially those of the cities, require not only ample portunities to expand and develop, especially by exercise, as in plays d games, but also specific motor training to correct the perpetual ndency to minor deformities.

III

The most thorough method of acquiring both mental and physical efficiency is by systematic motor education. We may then outline how this can best be achieved. Always the play-impulse should be encouraged. Varied and primitive industries, such as school gardening, vacant-lot cultivation—or one's own plot of ground affords incomparable opportunity for constructive mental and physical energizing. Amusement-games alone, however, often lead to listlessness, spiritlessness, impassivity, aimlessness, at best but negative qualities. Competitive games accomplish much more where there are able leaders to animate and direct action. The most educative factor is to stimulate the motor centers by enforcing precision of movement. A few exact movements conscientiously performed accomplish much more for accurate coordination than hours of listless, half-hearted movements. Routine, monotony, repetitions, weary minds and fatigue bodies, especially if indoors. Always it is the degree of spontaneity, the heartiness of response, the candor of cooperation, which make for progressive invigoration.

Hence the ideal educational agency, not only of gross motion, but of those modifications of motion, reaction-times, accuracy in eye, ear, voice, decisions, etc., is the game of ball and bat, or mimicries of chase and war, and such-like spontaneous impulses to do, to fight, to achieve. All exercises of quickness and precision are exhaustive; hence they cannot, or should not, be unduly prolonged for the very young.

Always the left hand should be trained equally with the right. There is too much onesidedness in any game played chiefly with one hand, *e.g.*, tennis, etc.

In appraising any plan of education, we should keep always before us the objects to be attained. However useful the acquisition may be of knowledge, rules, principles, etc., most, if not all, our daily conduct is regulated by habits. The habitual processes, both mental and physical, become so strong that they dominate not only the individual throughout life, but also nations and races. Habits formed during one epoch impress the citizen maturing in that epoch. Another epoch and different groups of impressions alter points of view and of action.

IV

Habits are motor modifications in nerve substance, which gradually become stable and accurate through repetition of acts, whereby they

›w more easy of performance. Memory is chiefly the product of ıntless actions which have been performed many times before. We nember most easily sense-impressions most frequently received, acts most often performed. Thus many neglected nerve-paths are veloped in brain-cells or fibers, also shorter and easier routes are quired, through connecting or associated structures. Thus habit nstitutes organic memory, which may or may not be accompanied active consciousness. Habits may be good or bad.

It is obvious that this store of working habits, mental and physical tomatisms, must be acquired as early and as correctly as possible, that the essentials of education shall be abundant, varied and precise; ıd that we may combine and elaborate them as we grow in age ıd facility. When the time comes to specialize in any direction e have need for an equipment in all the simpler automatisms so at we may group them unhesitatingly to form the basis of our later laptations.

It is in the last degree unfortunate if our early habits, dynamic sociations, are not sufficiently varied and exact to confidently assume ecision in responses when we need them as conditions for those ecializations, which later constitute our life-work.

Right habit formation is based on right guidance in motor impulses, d is essential to right thinking. New paths must be plowed out in ›tor soil, old paths revised; thus facility is restored and enhanced. ›r should any habit be permitted to become fixed. Capacity for riation is priceless; thus new and shorter routes can be travelled in e brain. When this capability is gone, then is the organism a derelict leed.

To attain useful facilities in any line of human endeavor the training the senses should be systematically pursued from the earliest mani-ıtations of attention. Sense perception opens up the way to form ncepts of objects, but is of use only when supplemented by motor ıpulse. Every normal sense impression tends to pass into movement, d is of use only in so far as it does so; in short, conditions for motor velopment depend upon sensory impulses.

Mental visualizations, interpretations of images, concepts of form, n arise only through motor outflows. Ideas are of potency in pro-rtion as they include the elements of motion, the impulse to do.

Thought is a word much in use, but the act of thinking is by no eans a constant process, even with the most intelligent. Much of ıat is called thought is, in most instances, merely automatic action oused by some sensory impulse. To think deeply, to exert intellec-

tual force, is rarely needed in the day's work; but every human being has constant need of myriad automatisms, the product of early and varied associations of sense impressions along with muscular acts. The product of these acts is the idea, the memory image. When rightly formed, full reactions occurring between observations and applications, the refined memory images become reliable guides to conduct. They serve most of life's purposes and are absolutely essential, and become, in the main, dependable. Promptings must, of course, be incessantly modified by intelligent inhibition, the checking of over-action, judicious selection of courses of action. The desideratum is balance between determination and execution.

A large proportion of the benefits derivable from any kind of graded motor training depends for its chief efficacy upon tranquilizing effects on mental turmoil. Exercise is almost universally conceived to be strenuous muscle-making, which, valuable as it is, may readily exhaust and harm, especially when not wisely directed. Perhaps in time mankind will learn that exercise is a normal and needful use of motor machinery, developmental, educational, preparative.

The whole category of competitive exercises is in reality calculated to induce endurance, and superiority, the factors of which are poise, elasticity of tissue, and absolute control of every volitional act.

Whatever the direction the life-work may take, that child is especially fortunate who is compelled to acquire a store of motor reactions long before the reasons for them are understood. This essential equipment is to be secured only during the period of plasticity, while the tissues, brain-cells, nervous mechanisms, etc., are elastic, impressionable. After this period, which slowly subsides, passing gradually into varying degrees of adaptability, the formation of new yet efficient automatisms becomes increasingly difficult.

V

Attention is tension in nerve-cells. Neurons which at any time furnish a physical basis for varying attention are subject to a thrilling vibration or quivering. There is voluntary and involuntary, or reflex, attention. Reflex attention is forced upon consciousness by external stimuli. These react upon visual, auditory, olfactory, or tactile centers and compel attention against the will.

Voluntary attention is correlated with heightened activity in cortical brain areas. Anxieties increase morbid hypersensitiveness and the whole makes for agitation, even turmoil, in the motor spheres. Tense

)luntary attention, long continued, will weary the strongest brain. rotracted over-stimulation induces exhaustion in brain cells, till they rink and become impaired. Muscular energy is also closely asso-ıted with integrity of neurons that all influences affecting them :ome of extreme significance, whether bearing upon mental or ıysical competency.

Sensations incite to action and in terms of the original capacity ıd the subsequent habituation of motor paths and centers. Unless oper association fibers in the brain are developed by suitable nutrition, derly adjustments, varieties of experience and right training, there ust result both motor and sensory, and hence intellectual, limitations. :nsation tends always to pass into movement. If there be no image ere will be no concept, and no concept can be formed without an :companying motor outflow.

Ideas differ in the proportion in which the motor factor stands to ıe other elements. In some persons ideas spring to life in profusion, perfection, and instantaneously; others require much time, and then eation is often unclear. Training can do much to enhance or tard. Interferences with normal ideation are induced by voli-onal insults, by inhibitions, counter-influences. Many of these ad-:rse influences are the product of doubts, indecisions, disappoint-ients, fears. Pent up motor energies are thus thwarted, hence result ychomotor overtensions.

Motion alone produces, achieves; hence, the importance of right ining to conserve energies. If defects are observed in method, ere is a need for retraining to enhance efficiency. Energies must be ected to definite ends. An idea is barren unless executed in some ıcrete fashion. Interruptions of ideas may be useful if the flow is ected into useful channels; if merely inhibited, they die; if suppressed, ıfusion results.

A reflex movement in neurons lies at the basis of every higher act volition. The idea of an act tends to initiate movement. The nsciousness may form a concept of the consequences of the act and eck it. This second idea may suggest a modification of the act, or opposite one. That which modifies the will is usually anxiety. tigue may inhibit; nothing is so exhausting as long-protracted atten-n. Doubts, indecision, blunders are thus induced. Exhaustion lows.

Oscillations are peculiar to the realm of feeling, usually dependent changes in the somatic realm and modified by accidental factors—vironment, dominating stimuli from without or within.

VI

Determinants of conduct are moods, emotions, feeling-tones. They in turn influence beliefs and likewise somatic (body) states. The most forceful, the most prevalent modifier of decision is some form or degree of fear, anxiety, apprehension. Then are cells, tissues, secretions, and above all, centers, affected, oftentimes seriously, and organic damage may result.

The power of idea, reason, choice, is limited; that of indirect, accidental influences tremendous. Even faith must not be too blind. Bad habits of mind and body evolve chiefly from indecision, apprehension, fear; seldom from overconfidence or aggressiveness. Few of those who seek or need medical advice are free from some degree or form of anxiety neurosis. Only among the acute diseases can we feel confident that this feature is absent; even here it may occur and modify vital processes. Hypertension of mind and body is a source of much impairment.

The factors of neurosis include variations in feeling-tones beyond normal or customary limits, in intensity, in periodicity, in slight disintegrations of mental phenomena, commotions in somatic processes, unusual reaction to stimuli, aberrant impressions. Some element of apprehension is usually present, often coupled with heroic endurance. In eccentricities of belief the emotions are thrown just a little out of gear, inducing disarrangements in the psycho-motor sphere.

DEVELOPMENT OF THE TEETH[1]

The Temporary Teeth

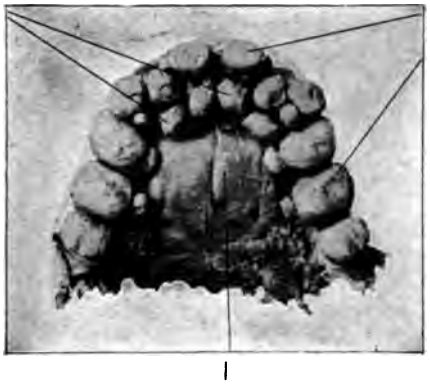
I

The first evidences of tooth formation appear at about the sixth week of gestation. A horseshoe-shaped ridge is formed around the jaw by a thickening of the epithelial layer. This *primitive dental ridge*, as it is called, is deeply seated in the mesoblastic tissue. As the epithelial tissue grows deeper and deeper into the mesoblastic substance, ten separate segments are given off. These buds, which become the enamel-forming organs of the ten temporary teeth, meet a resistance during their progress into the mesoblastic tissue which makes them slightly heart-shaped, the under side taking crudely the form of the

[1] By Elon L. Kanaga, D.D.S.

re tooth. Beneath the bud (or *enamel organ*, which it is now called) rs a condensation of the mesoblastic tissue and a differentiation ell formation. This area of specialized tissue becomes the dentinal lla and later the *pulp of the tooth*, which builds up the dentin. Both enamel organ and the dental papilla are now enclosed in a capsule ied of mesoblastic tissue and the whole is called the *dental follicle.* re are ten dental follicles in each jaw of the embryo.

Specialized cells develop in the enamel organ called the *amelots*, which deposit the enamel substances. The dentin is deposited layer of cells on the periphery of the tooth pulp called *odontoblasts.* The odontoblasts begin to functionate first, then the enamel organ osits its calcium salts upon the dentin.



110.—TOOTH-FOLLICLES FOR DECIDUOUS AND PERMANENT TEETH, THREE MONTHS AFTER BIRTH.—(*Broomell and Fischelis.*)

The development of the tooth proper, therefore, begins from the ian portion; the deposition of enamel progresses toward the incisal of the tooth and the deposition of dentin toward the root end.

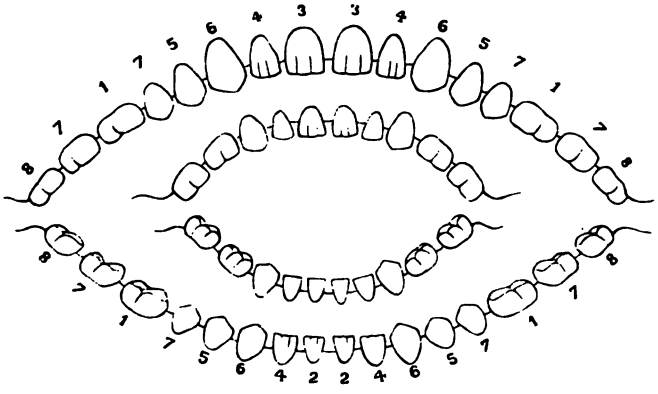
When a tooth is about to erupt the enamel formation is complete, the odontoblastic formation is only partially so. Therefore, the -chamber is large and *the root (or roots) of the tooth is not yet formed.* ends of the root are not completely calcified until about three years eruption, and the pulp-chamber continues to decrease in size for ral years. This is a more or less critical epoch in tooth formation; ie root is short and loosely held in the jaw, it is subject to injuries ny kind, from traumata, or systemic disturbance.

Since the ameloblast originates from the epithelial layer of the ryo, it is obvious that the enamel of the teeth arises from the same itive cells as the skin, hence is subject to the same modifications,

Cuspids at 11 years.
Second molars at 12 years.
Third molars at 18 to 25 years.

II

mptoms of Dentition.—The first stages of dentition are indicated
ague irritability of the child and a desire to bite. An increased
the saliva and disturbances of the intestinal canal are commonly
ed. The gums over the erupting teeth become raised and are
/ somewhat darker than the surrounding areas. If the process
es abnormal, this area darkens considerably, due to increased
mation and the child shows a decided feverishness.



.—THE FIGURES 1, 2, 3, ETC., INDICATE THE GROUPS OF TEETH AND THE ORDER OF THEIR APPEARANCE.—(*Starr's Hygiene of the Nursery.*)

ıen a tooth is further prevented from making its appearance the
ing tissues become white, the blood being kept from this part
essive pressure from beneath. When such a condition presents
ld experiences pain on biting instead of relief and refuses to nurse.
ı becomes extremely irritable, cries lustily for a time and may
e into a semi-comatose state, or, in extreme cases, convulsions
followed by coma. Skin eruptions and a cough often attend.
nal disturbances may also supervene and these disorders are
ɔly due to micro-organisms which develop rapidly in the mouth
time because of the inflamed condition.
e irritated state of the mouth mucosa, attendant upon dentition,
ages the growth of micro-organisms which do not flourish there
lly, and their passage into the intestinal tract is followed by fer-

mentation and decomposition, the products of which act as irritants and poisons.

That dentition should be attended with excessive pains which may result in convulsions, coma, or even death, is not altogether surprising when we consider the facts.

To recall the conditions: we have a rapidly growing tooth being pressed toward the gum surface to make room for the developing root beneath. As each layer of dentin is deposited, the tooth is pressed on farther. The thick well organized layer of gum over the tooth must become absorbed. If the child is in a healthy condition this process goes on with comparatively little disturbance. However, *if vitality is lowered and the circulation enfeebled or diseased, absorption of the overlying tissue does not keep pace with the development of the tooth*, hence the

FIG. 113.—Showing manner of lancing gums over advancing teeth.—(*Warren.*)

FIG. 114.—HUTCHINSON'S TEETH.—(*Warren.*)

area becomes inflamed, the blood stagnates, and as a result waste products are not properly removed, absorption process being greatly retarded. The development of the tooth continues, however, and the time arrives when this little space contains more than it was designed to hold. Now, at the root end of the tooth is a complex, highly sensitive structure of nerves and blood vessels. It is not the pressure of the tooth upon the gum which causes the pain, but the *back pressure of the root upon these nerves.*

There are numerous cases on record where the pressure of an impacted tooth upon a nerve has caused profound mental disturbance, even insanity.

Delayed or hindered dentition may be classed as a mild form of impaction and the pressure on the underlying nerves in such a case explains the convulsions and the distressful condition into which the little sufferer subsides. If the irritation persists the nervous system

becomes deranged and acts erratically, hence oftentimes convulsions occur in infants of unstable nervous equilibrium.

Biting upon hard substances, especially ice, affords some relief in the first stages, but this gives pain later. Rubbing the gums with the finger aids the process of dentition; serious conditions require lancing.

III

The Importance of a Perfect Deciduous Denture.—The importance of keeping the baby teeth in good condition is usually underestimated. It is commonly supposed that the deciduous teeth, providing

FIG. 115.—Shows arrested development of facial bones due to irregular arrangement in childhood; full complement of teeth except second molar; retentive mechanism undeveloped.—(*H. W. Pullen in Johnson's Operative Dentistry.*)

but temporary service as they do, exert no influence upon the permanent set, and that their premature loss is of but small import. This, however, is far from the truth. *The teeth form a framework which regulates the size of the bones, not only of the jaw, but of the entire face below the eyes.*

If a temporary tooth is lost from the arch the adjoining teeth move together to fill the space. The bone then is not forced to its maximum of development, and when the permanent teeth make their appearance insufficient room has been provided for them and they become crowded together. Retaining a baby tooth beyond its proper time for shedding is almost as detrimental as its premature loss. The permanent tooth beneath, in this event is deflected from its proper path and, if it erupts at all, must necessarily be badly out of position. Its course may be

so altered that it is possible for it to assume even a horizontal position, in which case it would never erupt, but become a source of lasting irritation.

The odontoblastic layer of the dental pulp, from which originally the root is formed, becomes a destructive agency which dissolves and

FIG. 116.—Facial inharmony due to under development of superior maxilla caused by l long retention of some of the upper anterior temporary teeth.—(*H. W. Pullen in Johnson Operative Dentistry.*)

FIG. 117.—Same case as above.—(*H W. Pullen in Johnson's Operative Dentistry.*)

removes the roots of the temporary teeth. *If this mechanism is d stroyed through decay, the roots remain firmly anchored within the bon and the teeth are not shed at all. Irregularity of the permanent set the result.* The appearance of the child is marred for all time.

Another danger arising from neglect of the temporary denture is the possible *injury to the permanent teeth* in the early stages of their development. A permanent tooth may be entirely ruined by the poison thrown off from an abscessed temporary tooth above it.

As already indicated, the conformation of the jaw is influenced definitely by the position and arrangement of the teeth as they form in the dental arch. As the teeth force their way through opposing tissues they guide and direct bone growth, and hence influence the form and size of the jaws, both upper and lower. Thus in turn there is produced a marked effect upon the conformation and size of the bones of the face.

FIG. 118.—Unsightly appearance due to lack of development of superior maxilla. —(*H. W. Pullen in Johnson's Operative Dentistry.*)

As the teeth grow and make room for themselves they force the bony framework in the jaws to adapt itself to their needs, as to both shape and size. This phase of growth, therefore, exercises a powerful effect upon the contour of the face, hence upon personal appearance.

It will thus be plain that, in the process of evolution of the teeth, so do the shape, size and arrangement of the component parts of the face evolve. Any deviation from the normal direction of growth values is followed by departure from the inherent plan and leaves an indelible mark on the countenance. Some of these forces may be guided. Whenever they tend to go wrong every effort should be made to keep them straight.

If the bones of the face are contracted, the air-chambers within them are smaller, the air-passages of the nose are constricted and the ability to breathe properly falls far below normal. Adenoids commonly result from this condition.

There are many other good reasons, however, why every individual should secure, if possible, a full complement of teeth capable of perfect occlusion.

IV

Irregular Teeth and Their Baneful Effects.—Teeth that are irregular and crowded decay more quickly than those in proper mechanical relation to each other, for the very obvious reason they *cannot be kept clean.* The teeth are so formed that, when in proper relationship they come in contact near their grinding surfaces and a large open space is left between the necks of each two teeth. Any particles of

FIG. 119.

FIG. 120.

FIGS. 119 AND 120.—Mouth breather at six months and seven years.—(*H. W. Pullen in Johnson's Operative Dentistry.*)

food small enough to be forced between the contact points are easily washed out of the larger spaces between the necks by the natural excursions of the fluids of the mouth.

In cases of irregular dental alignment, or arrangement, where the necks of the teeth are in contact, the food is retained in position or wedged more and more tightly into the interspaces and impacted upon the gums.

Irregular dentures more quickly deteriorate in old age because pyorrhea alveolaris attacks them readily.

The teeth are by no means separate and independent organs. They are all related more or less to each other as regards position and durability. For example, if a tooth is lost the adjoining teeth move together to fill the space. There seems to be a provision of nature whereby teeth having no opponents are gradually elongated until they are finally thrown out of the mouth entirely. In an irregular set there

are always several which do not occlude with others of the opposite jaw. In the young individual these teeth do not exhibit such tendencies, but as middle life approaches this elongating process begins. As they are shed or thrown out and the adjoining teeth move together others of the opposite jaw are left with no opponents and are in turn thrown out. And so the process continues.

V

Orthodontia, Correction of Deformities of the Teeth.—The teeth of the upper jaw, when in normal occlusion, project beyond the lower

FIG. 121.—Cast of mouth of child (on page 1080) at later age, showing contraction of tooth arches giving insufficient room for eruption of lateral incisors; facial distortion accentuated as eruption of permanent teeth progresses.—(*H. W. Pullen in Johnson's Operative Dentistry.*)

ones. The upper anterior teeth should overlap the lower ones about one-eighth of an inch. The upper molars and bicuspids besides overlapping the lower ones, are placed anteriorly to them about the width of one cusp. The fact that the lower central incisors are one-half the width of the upper central incisors permits of this arrangement. The region of the first molars is the base for examination of the extent and character of irregularities, and is also the foundation point in the actual operation for correction. This branch of dental art for the regulating of teeth is called *orthodontia.*

The principle of action *in applying orthodontia* is to maintain a gentle and *steady pressure upon a tooth in a direction toward the position which it should normally occupy.* The bony structure upon the side of positive pressure will then become absorbed. Upon the side of minus pressure bone develops. Teeth can be moved thus for considerable distances.

The appliances used are rigid wire arches, ligatures and plates. *All pronounced irregularities of the teeth should be corrected.* It is not unusual for a very decided case of malocclusion to be unrecognizable to those not trained in this particular branch of anatomy, even in instances where a marked distortion of facial contour has occurred. For this reason it should be *the duty of every person who is responsible for the development of a child, to seek the opinion of a reputable dentist as to whether or not the child requires the services of an orthodontist.*

FIG. 122.

FIG. 123.

FIGS. 122 AND 123.—Showing contracted arches and insufficient space for reception of anterior teeth due to mouth breathing.—(*H. W. Pullen in Johnson's Operative Dentistry.*)

The causes of malocclusion are many, among them being the premature loss of the temporary teeth, too long retenton of the baby teeth, early loss of permanent teeth, thumb-sucking and mouth-breathing.

The operation for correction should be started as soon as the child is old enough to endure the slight inconvenience to which it must be subjected.

Parents will be chiefly influenced in having the teeth of their children straightened by esthetic considerations. Indeed, this is of vast significance and cannot be too highly urged upon them. *The whole conformation of the face is made or marred forever by the development of the dentures.* But the compelling reason for expert attention during the evolution of dentition is that, *unless the teeth form normally, so that occlusion shall be as nearly perfect as is obtainable, the health of the child is likely to be seriously affected.* Unless the grinding surfaces of the teeth meet accurately, each one in normal alignment, in proper distance apart, the perils of bacterial invasion are enormously increased; the

teeth cannot be kept clean; irritation and fermentation ensue. Irregular teeth readily succumb to one or another form of destructive change, of which the worst is pyorrhea alveolaris. They are then liable to be lost in middle life or early old age, and serious digestive disorders and systemic infections are likely to arise.

If the arch of the mouth is narrow and constricted as a result of irregular teeth, the bones of the nasal region are undersized, the air passages are small and the individual's breathing apparatus is below normal capacity, inviting diversified disorders.

FIG. 124.

FIG. 125.

FIGS. 124 AND 125.—A mouth breather before and after removal of adenoids and orthodontia treatment.—(*H. W. Pullen in Johnson's Operative Dentistry.*)

HEREDITY: OUTLINE OF BIOLOGIC FACTORS IN DEVELOPMENT AND DEVELOPMENTAL ARRESTS AND FAULTS

I

The nature of heredity is one of the most abstruse problems in biology. The work of cytologists has led to the teaching that *the heredity-bearing substance of the germ plasm is contained in the chromosomes of the germ cells.* The school of the preformationists hold that there exist in the chromosomes determiners or determinants, or morphologic elements representing *unit characters* or *traits*, the presence of which in the chromosomes of the impregnated ovum leads to the development in descendants of similar morphologic and functional characters existing in ascendants. The names of Weismann and of E. B. Wilson are most

prominently associated with this theory; and it is in connection with this theory that the followers of Mendel explain variation. Others deny the existence of unit characters in the germ plasm and explain the reproduction of morphologic parts and functional traits in descendants by the theory of Epigenesis. For a study of the theories of the two schools of biologists, the reader is referred to standard works upon biology and heredity. A study of this literature, more especially the works of Weismann, Wilson, Rignano and Adami and the current observations of the followers of Mendel indicate that the problem is not yet solved; but the weight of evidence appears to be in favor of the *existence of unit characters in the germ plasm*, through which Ontogeny becomes a recapitulation of Phylogeny—the law of recapitulation of Haeckel. Viewed in this way, the force of heredity corresponds with evolutionary development, and unless interfered with by unfavorable evironment, reproduces in each organism the morphological and functional traits of its ancestors.

II

In the human family, the problem of heredity is far more complex than in the vegetable kingdom, or even in the animal kingdom below man. Each human being has such a multitude of ancestors, representing such manifold lines of life, when one goes back not more than a thousand years, that the problem in permutations and combinations as to the traits or variations in traits which may enter into and constitute his organism, becomes extroardinarily complex—so complex as to make it evident that the principles involved in heredity must be worked out in the vegetable kingdom and in the lower animals to a very large extent. It is for this reason that the observations of those working along the lines laid down by Mendel are of so much value in throwing light upon the problems of heredity.

Heredity may be considered as the force which leads to the development of an organism having the traits both morphological and functional of its ancestors; and as comprising also the processes which lead to variation. In unicellular organisms, in which reproduction takes place by simple fission, each new protozoan is the replica of the ascendant. Conjugation in protozoa and amphimixis or sexual reproduction, introduces the new factor that the descendant is the product of two lines instead of one line of life, and this introduces the factor of variation. If all the ascendants have been of sound stock and of good constitution, heredity will bring it about that the descendant will

likewise be of sound stock and good constitution, unless environmental factors are sufficiently unfavorable to arrest typical development.

On the other hand, there are strains or stocks which have particular defects that appear from generation to generation, which defects are believed to be due to defects in the germ plasm—to alteration in, or to the absence of, determiners in the germ plasm; which condition ensures through heredity, the existence of the particular defect in the descendant.

There is no satisfactory explanation of how this defect in the germ plasm comes about, or rather the process whereby it comes about has not been demonstrated. The belief that hereditary defects in particular stocks are due to defects in the germ plasm is due to the observation of the defects themselves, and not to a demonstration of any change in the germ plasm itself. Such stocks are said to have a bad or morbid heredity.

III

There are many defects of an hereditary nature which fall within the class of morbid heredity just discussed, such as polydactylism, moles, particular defects of the ear or other external organs and the various diastheses, such as the nervous, the arthritic, and that which leads to diabetes. The status lymphaticus is probably an heredity defect. Such defects or diatheses are due to arrests of development of the cells of certain organs or system of organs.

There is another type of arrest of development which is commonly called morbid heredity in the medical profession, which, however, is of a distinctly different nature, and should be called *environmental developmental degeneracy*. This is due to the influence of an unfavorable environment interfering with and preventing in whole or in part, the influence of heredity in reproducing the morphological and functional traits of ascendants in descendants. It is purely a question of environmental action, and is not heredity in its true sense. The human organism is said by some to have a post-natal, an ante-natal and an ante-conceptional existence. Prior to conception, the human organism has a double existence as the germ cells in the bodies of its two parents. Morbid states in the parents, whether brought about by the usual or more general causes of death are brought about by alcoholism or by syphilis, have been shown to have a modifying influence upon the development of the germ cells called by Weismann "Affection of the Ovum." How this acts, has had great light thrown upon it by the work of experimental teratologists. The various diseases are asso-

ciated with the circulation within the body of toxic substances, the molecules of which react upon or inter-act with the molecules constituting the germ cells, thus modifying their chemical constitution and their vital state. When impregnation takes place with such germ cells, the resulting impregnated ovum has not the potentialities of one from two individuals who have been free from disease. Toxines, whether in the pre-conceptional, post-conceptional or post-natal periods of development, act in part by interfering with the normal or typical results of heredity; and in this way may bring about arrests of development similar to those that are hereditary.

It is admitted that the germ cells may be influenced or affected prior to impregnation by environmental influences. The unsolved question is as to whether a repetition from generation to generation of similar environmental causes may eventually so influence the germ plasm as to bring about defects in it, which are hereditary in the true sense; *i.e.*, as to whether acquired variations may become hereditary through permanent alteration of the germ plasm.

THE EVOLUTION OF DEVELOPMENTAL ARRESTS OR FAULTS

I

The essential nature of developmental and of constitutional defects in infants and children is largely, indeed almost wholly, similar to that of adults. The only difference is that an unfavorable environment subsequent to childhood may bring about arrest of development in those who have passed beyond that age.

Constitutional and also local or particular defects or anomalies due to hereditary influences, or to morbid heredity, are universally recognized. The occurrence of analogous, although dissimilar, defects due to environmental causes are far from being accepted as facts by the biologic world. Among the profession there is a not well-formulated opinion, rather widely current, that disease and likewise so-called bad habits acquired by the parents may be inherited by their descendants. This, however, applies more especially to the subjects of syphilis and of alcoholism and other similar results of vicious habits. On the part of biologists there is well-grounded opposition to the acceptance of the teaching that such morbid states can be looked upon as hereditary. Their objections likewise apply to accidentally acquired defects, or to defects acquired from environmental causes. Such, for example, as the loss of the foreskin through circumcision,

of a leg or other member through amputation, etc. Weismann is the leader of this school of biologists, whose opposition is bound up in their position as to the non-inheritance of acquired characters.

II

It is generally accepted by biologists that the heredity-bearing elements contained in spermatozoa and in ova are to be found in the chromosomes of the spermatozoa and of the ova respectively. It is pointed out by Weismann that as neither alcohol nor alcoholism is a chromosome, nor yet a part of a chromosome, it cannot be inherited. A similar line of argument would apply to the spirochete and to the bacillus tuberculosis as the causal factors in syphilis and tuberculosis respectively. In this connection it is undesirable to discuss further problems of the inheritability of acquired characters. This subject must be studied in works devoted to biology. Weismann himself, however, in discussing the cognate questions of the influence of alcoholism and of syphilis in the ascendants upon their descendants, recognizes that the spermatozoa and also the ova may be influenced through the action of alcohol upon the constitution of the host and upon the germ cells themselves. The term which he uses as representing the consequences of alcoholism is "Affection of the Ovum." In admitting that alcoholism may detrimentally affect the germ cells and that as a consequence the impregnated ovum is defective in its potentialities, Weismann admits, in principle, that descendants may be born of parents with a defective constitution due to factors in the environment, or to the acts or habits of, or accidents to, the ascendants. In a strict or biologic sense, they have not inherited their defects; on the contrary, they acquired them in their pre-natal or pre-conceptional life, through the body and by way of environment.

Those who hold that degeneracy in the human family is only hereditary in nature deny that defects in the descendants acquired as above described constitute a form of degeneracy. This is a mere repudiation of the name of the condition and not a denial of the fact itself; which, indeed, cannot successfully be disputed.

III

Modern experimental teratology, as shown by Dareste, Feré, Roux, Mall and Stockard, clearly proves that unfavorable environment or protoplasmic poisons, whether physical or chemical in their

nature either bring about the death of, or cause arrest (or arrests) of development in, the evolving organism. The work of Jennings on *Senescence in Protozoa*, likewise, clearly proves that degeneration in these organisms is produced by an unfavorable environment. The facts of clinical medicine, as gathered by Ballantyne and set forth in his *Ante-natal Pathology*, likewise demonstrate that in the human family *protoplasmic poisons circulating in the blood of men and women both can, and do, poison or injure or arrest the development of human beings during their pre-natal existence*—whether as sperm cells, ova, impregnated ova, or in the embryonal or fetal states. Because experimental teratologists deal with lower animals, their demonstrations apply to them; but both analogy and also the evidence collected by Ballantyne, teach that the same facts are true of the human organism, as are demonstrated of the lower animals.

From the above it must be concluded that degeneracy or arrest of development can be, and is, brought about by factors of an unfavorable environment, which may otherwise be expressed as protoplasmic poisons circulating in the bodies of ascendants.

The work of Stockard and others clearly shows that primary cells, the cells of organs, or of systems of organs, which are most affected by protoplasmic poisons, are those which are most embryonal, or least somatized, or least evolved, at the time when the poisons come into relation with them. When death of the evolving organism does not follow, the effects of the action of the protoplasmic poisons upon the germ, embryo, or fetus, are most marked. The more gross their nature, and the earlier agents act upon the growing ovum, the greater in degree of intensity is the poison. That is, when the growing ovum is poisoned in the early days of pregnancy gross monsters are caused, such as those without heads, or with two heads, or other monstrous anomalies result; whereas, somewhat later are produced lesser anomalies or arrests, such as hare-lip, cleft-palate, spina bifida, club-foot, etc. It has also been found that certain poisons have elective affinities for certain tissues, and thus it is practicable to bring about, by using a special poison at certain periods in the development, definite arrests or morphologic defects, such as either hare-lip or spina bifida. It has been found, more especially by Roux, that if, in the two-cell stage of the growing ovum, the two cells are mechanically separated, each may produce an entire organism of half its typical size, or may produce one-half of an organism of full size. This is believed to be the explanation of the birth of human identical twins. In this case both twins are of the same sex and there is but a single plancenta and membrane for the two

twins; whereas, other twins may be of opposite sexes and each has its own placenta and membrane.

IV

It has been found that the nearer the period of birth poisons are introduced into the developing organism, the more general in character is the arrest, when mere arrest of development instead of disease is the consequence. Such arrests of development are so general in their nature as to find their expression in a lowering of the vitality of the organism, or in a lessening of its potentialities, rather than inducing malformations of structure visible to the observer. It is believed that arrests similar in their nature are likewise due to affections of the ovum brought about by disease in either parent prior to impregnation. Such arrests lead to developmental hypoplasia, or, as it is otherwise called, constitutional inferiority, or asthenia universalis congenita.

Arrests of development, or agents making for degeneracy, due to environmental causes are thus seen to be relative in degree and to depend upon three factors: (1) the period of time at which the growing organism is poisoned; (2) the degree or quality of the poison itself; and (3) the particular nature of the poisoning. The earlier the poison is introduced and the greater its degree, the more monstrous is the arrest of development. Subsequently, the arrest is to be found in the organ, or system of organs, the cells of which are least somatized at the particular time. And later, the arrest is of a more general nature and manifests itself especially in a lowering of vitality, or a constitutional inferiority, and its morphological expression is slight in degree and is general in its nature. This constitutes developmental hypoplasia.

In the absolute sense, every higher organism, including man, is an instance of arrest of development, as it is impossible for every cell, or for the cells of each organ, or for each system of organs, to be equally somatized or evolved; hence each human being has its *locus resistenciæ minoris*, or its diathesis.

V

Most of the well-known *diatheses*, such as the nervous, the arthritic, the tubercular and the glandular—leading to diabetes, are undoubtedly hereditary in their nature. The so-called lymphatic diathesis of the French is probably more often of environmental origin and is allied to

the *status lymphaticus* and to developmental hypoplasia or environmental origin. This view has not been generally accepted, but the evidence in its favor appears to be conclusive. From the standpoint of the experimental teratologists, all mankind are terata or monsters; but most men have arrests of so slight a degree as to appear typical, or as it has heretofore been called, normal. Man should be divided into three series: (1) Those of sound stock and of good constitution. In them the arrests are so slight in degree as to be unrecognizable until they are subjected to an environment sufficiently unfavorable to bring about disease; when their *locus resistenciæ minoris* becomes apparent.

(2) Environmental developmental degenerates. In them vitality is below the norm, or they are deficient in their potentiality for developing energy. Likewise, they are more subject to the incidence of all diseases than are those of sound stock and good constitution, because of their lessened powers of adaptability or of resistance to an unfavorable environment. They are examples of developmental hypoplasia and relatively are of the lymphatic temperament.

(3) Hereditary degenerates. In them the particular arrest is more manifest and each exhibits one or more of the well-recognized diatheses. They are also more subject to the incidence of disease than is the case with those of sound stock and good constitution; but are especially liable to the incidence of particular diseases of a diathetic character.

In addition there is a sub-class of mixed hereditary and environmental degenerates. As hereditary degenerates are more subject to disease than are those of sound stock and good constitution it follows that disease in them as ascendants causes in addition the arrests of development due to their particular disease in their descendants more frequently than is true of the first group of sound stock and good constitution.

REMARKS ON THE TREATMENT OF CHRONIC DISEASE

All remedies for disease are valuable in proportion as they render available inherent self-protective and self-reparative powers. The body, moreover, is a concrete, living entity, not made up of separate parts, like an insentient machine, any one of which is capable of acting and reacting independently of the rest. In the sentient human machine, wherever there is local damage or derangement, this can be removed only by eliciting the full co-operation of all the component mechanisms, and being aware of the interdependence of every part. Nowhere is

the significance of this co-operation of all parts more direct and important than in the treatment of protracted disabilities and for many reasons. Among these is that, whereas in traumata (fractures, wounds and other strictly localized damagements) the remainder of the organism is presumably at the time in a state of full integrity (hence with full capacity for prompt and complete repair) conditions are quite otherwise in protracted, long-prevailing disorders; the results are manifest in slow but steady disintegration of tissues—in the retroaction caused by depression in both the psychic and physical spheres of activity. Unless the individual is regarded as an all-round well-balanced organism with full consideration of all the essential factors constituting health (not forgetting permissible variants), the best results cannot be attained either in conservation or in repair.

In acute disease, notably the infections, there is fever, a defensive process whereby the autoprotective forces are aroused to the performance of their most perfect work. Much can be done to control and direct them. The problem is then relatively simple, since the organism is presumably normal when infected.

In chronic disease, the defensive powers are gradually overwhelmed, the vital forces exhausted in varying directions and degrees. No longer can they be relied on promptly and efficiently to meet and overcome damaging or morbific agencies. Not only so, but the causal factors become increasingly complex—a blend of psychic confusion, loss of physiologic conservation, and structural disintegration. Be the factors few or multiple, the whole symptom-complex becomes one of impairment not only of the governing vital mechanisms, but of the entire organism. Therapeutic agencies must, then, include systematic encouragement of all functions, rehabilitation not only of disordered noble organs, but of systems deranged as a whole.

Hence the best remedies consist of agencies for conservation of the action of circulation, respiration, metabolism, etc., not forgetting the inevitably impaired consciousness. Mental deviations invariably occur and must not only be first considered, but in all stages reckoned with.

The circulation stands next in importance, and the fact that the skin area is the largest, most readily influenced factor in sensation and reflex irritation should never be lost sight of.

Respiration stands at the basis of oxygenation, the muscular system being an efficient ally. Both require education and exercise. The digestive organs, elaborate as they are, cannot carry out their complicated program unless they are and remain in full accord with

the entire group of hydrostatic mechanisms. They cannot act and react harmoniously unless they be, and remain, in normal or nearly normal mechanical interrelationships one with another, their centers, nerves, and connecting parts unimpaired by faulty position, torsion, compression, or by disarranged or inadequate support from relaxed or feeble external walls. Surgery has contributed much to the elucidations of conditions existing in the domain of chronic disorders of the viscera by supplying exact knowledge through sight and touch when the concealing tissues are opened or removed. The integrity of the skeletal structures here exercises a powerful contributory influence. Not only must these gross structures be maintained at their best, but wherever they suffer impairment beyond a certain degree the integrity of the vital processes suffers to an extent too generally overlooked. Elasticity is an essential factor in all tissues except a few, like the bones, ligaments and tendons. Hence loss of tissue-tone, rigidities, adhesions, excessive compressions and relaxations are factors which demand full consideration in solving any problem of long-standing functional disrepair.

Chronic morbid processes, while of wide diversity and due often to special disease entities, none the less, are at bottom mere outgrowths of vitiated physiologic processes. Physiologic processes are uniform in their manifestations not only when normal but also when deranged. The human organism is disturbed by disease, of whatsoever nature, along strictly analogous lines. The special features may and do vary but chiefly in accordance with the structures altered, rather than by reason of the nature or character of the disease itself. The essential machinery, the vital processes of life, growth, change and repair, can, if rightly conserved, be made to do their work as well as the damagements present permit. Hence, the organism as a whole is usually capable of recovering a fair measure of efficiency. Thus it is the duty of clinicians so to enhance the autoprotective and regulative mechanisms as to compensate for the specific damagements.

This truism may seem so obvious as to need no elaboration, yet clinicians too often overlook the fact that these deranged physiologic processes can frequently be so utilized, brought into line and enhanced as to secure degrees and kinds of betterment not otherwise obtainable.

Often closely analogous phenomena arise in persons suffering from morbid states widely divergent in essential pathology. Our remedial resources in chronic disease depend for efficiency upon a correct appreciation of: (1) the particular disease process; (2) what remains of the reparative powers of the individual as a whole, and (3) the degree

d quality of the integrity of the structures deranged, damaged or stroyed.

Always behind the toxic entity there is a damaged human organ-ı, a suffering human animal, whose recovery depends in the final ıe upon how far it is possible to reawaken and redirect the inherent ces which maintain life.

In almost every individual suffering from protracted disease the er is complicated by disorderliness in the mental and emotional ıeres. Unless these aberrancies are reckoned with, the springs of ught and action, and especially of feeling, set in order, balanced, dered more normal and systematic, a large part of the symptom-ıplex persists. The feelings, disordered as they are, need full sideration, skilled interpretation, and sympathetic direction. e mind may be clear and efficient in some respects, but in ers is not, and should be put into splints, rested, soothed and trained.

Especially are responses to physical stimuli from within liable to misinterpreted, the more important ones subordinated and the ıer ones exaggerated. Some lesions of gravity are wholly non-sory; at least, awareness has not yet arisen to the threshold of ısciousness (*e.g.*, abscessed teeth, impactions, splanchnoptoses, and er latent lesions capable of exciting complex distresses). Dis-bances thus established between receptivity and determination ve then become more or less automatic. They exert a persistent ct on physiologic integration, aggravating any existing minor ıartures from the norm. Disorders so initiated vary in propor-ı to the progressiveness of the functional eccentricities and the sus-tibility of the consciousness, its propensity to go astray, or aptness dominate the physiologic processes; in short, complex diseased tes depend for solution upon the subserviency of the body to the ecting agencies, conscious or intuitive.

The whole problem of nutrition is shown to rest largely on how d is prepared, selected and, above all, masticated. High and low teid dietaries, intestinal putrefaction, and the like questions settle mselves often by self-regulation of tastes or growing awareness of tinctive needs, learned through revised habits of eating.

So skin hygiene, consistently utilized, is capable of more than con-vation, even of radical reconstruction. Facts brought accidentally our attention have led us to secure unexpected and gratifying re-s by this means in chronic or muscular rheumatism, chronic neph-s, gout, myositis, disintegration of circulatory structures and of the

central nervous system, etc. A diseased kidney is often normal in parts, and to its ability to regenerate there is no known limit.

Water externally is only second in importance to water internally. The history of spa treatment furnishes massive evidence worth studying. Colonic irrigation not only cleans out the lower bowel (made classic as a danger center by Metchnikoff) but also furnishes the best and simplest relief from toxic effects in many forms of genitourinary disorder. This diuretic action of colon-flushings—really invaluable—is alluded to in literature only incidentally, though it furnishes an excellent remedy in many chronic disorders where the heart and kidneys are competent and renal inadequacy is a feature. Of course, one should be careful to avoid overmuch of fluids in chronic nephritis and high blood-pressure with a weak heart. Salt should not then be used.

Respiration, commonly regarded as merely an automatic function, is capable of education and development into a potent agency for conservation and reconstruction, as the Yogis of India, and endemic enthusiasts elsewhere, have abundantly demonstrated—even after their claims are heavily discounted. Our own experience with systematic respiratory education has been gratifying, especially in strengthening bed-ridden, lame, or otherwise handicapped folk. The use of this measure in chronic cardiac disease is plainly desirable.

This brings us anatomically to another auxiliary agency, viz., increased elasticity of the joints, ligamentous, and other mobile structures as a factor in sustaining vigor. To secure results from respiration obviously the thoracic structures must be normally elastic, and also the abdominal muscles must preserve normal tone—they very rarely do. Here educational exercises are required and accomplish much.

In the spinal column originate and are contained thirty-one pairs of spinal nerves. Between each two vertebræ lie cell-bodies closely concerned, among other duties, with vasomotor innervation. It is of deep significance to the welfare of symmetrical vasomotor action that the erector spinæ muscles, innervated as they are by the posterior primary divisions of the cord, shall be, and remain, normal and elastic. Correct posture is a corollary of elasticity. This includes the whole subject of mutual interrelationships of the viscera.[1] Attitude bears a close clinical relationship to normal functionation: *e.g.*, defecation, parturition, etc.

Surface structures in chronic states frequently need support, moderate compression, agencies which call and keep the blood to a

[1] See paper by author, "Orthotherapy," Monthly Cyclopedia, Jan., 1914.

ocality. This relieves sensory disturbances, even when deep-seated, nvites phagocytes, and in other well-known ways encourages dormant ctivities. Bier's methods are valuable, but at best they are rather mphatic and unless frequently applied their effects more or less tran-ient. Oftentimes it is desirable, indeed much better, to maintain this passive hyperemia gently, continuously, and uniformly. The pplication of thin rubber tissue, as employed by Morris Longstreth, ere serves a most satisfactory purpose. A part can be steadily in-luenced by wrapping the surface in rubber tissue. It is the only neans we have found to affect satisfactorily the soft structures of the bdominal area, and to aid the ebb and flow of fluids in waterlogged tructures.

Conclusions

1. In chronic disease the organism as a whole becomes exhausted hrough protracted, complex derangement; hence, reparative agencies re at a disadvantage as compared with the normal poise and efficiency f the organism when acute disease or injury arises.

2. Therefore, the pathology of chronic disease is something much more than that of acute states, involving many problems of morbid physiology and psychic disorder yet unsolved.

3. Remedial measures must be directed to the restitution of functional poise and should include all those rational measures capable of conserving and enhancing the autoprotective and autoregulative forces.

4. The basis of relief and cure is to be found along the line of palingenesis (development according to the primitive or original method); also of the overcoming of agencies which retard physiologic processes —rehabilitation of all functionally deranged organs, regulation of all contributory factors in vital action, so that full compensation shall be achieved of existing damagements.

5. The utmost drugs and medicines can do is to contribute to these lesirable effects, however nearly they may approach to the rôle of "specifics," for overcoming disease entities, unlocking the doors for oxic wastes, and freeing the organism as a whole from disabilities resent.

6. The measures on which, in the final count, we can chiefly depend re included under the term *personal hygiene:* (*a*) conservative personal hygiene; (*b*) constructive personal hygiene, and especially (*c*) reconstructive personal hygiene.

7. The possibilities of reconstructive personal hygiene in addition to the cure of existing disorders lie in the direction of making available latent, undeveloped energies in any adult below the norm, from whatsoever cause; in systematically utilizing the inherent dynamics, and in raising the coefficient of efficiency.

8. We would call especial attention to the fact that much can be achieved by bringing into line the functional power of the organs and tissues so as to secure the completest transformation of dynamic into kinetic energy no matter what morbid agency co-exists.

9. Special vigilance is urged upon clinicians in restoring tissue elasticity, mobility, normality in the hydrostatic mechanisms; in amplifying the functional powers of respiration, circulation, urination, the skin, etc., and in affording support for relaxed structures.

DEFORMITIES IN CHILDREN FROM THE STANDPOINT OF THE GENERAL PRACTITIONER

I

The medical practitioner should keep in mind the significance of minor deformities often revealed only by a careful observation of children. In the hurry of routine work he is tempted to omit that complete search which is an essential of thoroughness in the examination of all children. It is a mortifying experience to learn we have failed to note some significant point which has later been found by someone else. "More mistakes are made by not seeing than by not knowing" (Jenner). No examination is satisfactory unless the child is entirely undressed. To search thoroughly the surface of a child's body is an easy task compared with an adult.

To achieve a rapid and comprehensive opinion on the conformation of a child is invaluable; never be content with casual judgments however satisfying they may seem. One of the most unfortunate effects of mordern ultra-specialism is the confiding faith which induces both the physician and the patient to wait until some conspicuous deformity is revealed, which is then hurried to the orthopedist for correction. It is wiser to avail oneself of opportunities for making a thorough search over the bodies of all those in his keeping. Thus one can correct deformities in their incipience. In our post-graduate schools the department for correction of deformities is not appreciated by the average student; yet a few hours there spent would afford invaluable training in the significance of thoracic deformities, always of the utmost significance in the study of the disorders of the great organs in

the chest, similarly by examinations of the abdomen to determine disturbances of the contained viscera. Displacement of the various organs and even unsuspected systemic diseases (Figs. 1, 2 and 3) may thus be found. Even so marked a condition as pseudo hypertrophic muscular paralysis is often discovered, only after complete undressing.

II

Many disabilities regarded as belonging to the province of the surgeon come first under the eye of the general practitioner, who may or may not possess skill or special judgment to deal with them; yet they demand prompt recognition and early care to prevent their increase or permanency. They should also receive suitable constitutional treatment at his hands both before and after being referred to the surgeon or orthopedist. Again, they should be so closely observed that he can supply the surgeon with a record of progress on which alone his best judgment can be based.

Hernias are rarely suspected or discovered unless the ring is explored and found weak or patulous. Abdominal hernias are oftener met, but may escape attention, and are too frequently wrongly regarded as of little importance. Many annoying and persistent digestive disturbances are referable to small umbilical hernias. The persistence of many derangements of digestion prevent the cure of hernia. Malformation of the head in infants may lead to serious mental conditions. Deformities of the legs and ankles, such as club-foot, flat-foot, etc., can in many cases be corrected by the attending physician before the period of walking. He is the one to recognize and initiate the treatment of these and many minor departures from normal conformation and should judge when to call in the specialist, noting carefully the phenomena associated with faults of conformation, attitude, etc.

If a club-foot be treated from the day of birth by stretching, manipulations, and light plaster-of-Paris bandages, the orthopedic surgeon will find little to do when the child begins to walk.

The bones of the tarsus in a baby are as soft as putty and may be moulded into position with ease at birth; whereas, if the condition is neglected till six months or a year, some form of forcible correction or cutting operation will be demanded.

In children many deformities arise which may become permanent and disabling, or disappear entirely. The worst instances of rhachitic deformity are seen in crowded cities where activities are less spontaneous and encouraged, where natural and artificial restraints and

deprivations are too continuous and severe. The fundamental cause of rhachitis is faulty metabolism, which may arise from excessive and improper food of good quality, as well as from deficiencies. Once the tendency to deformity is established, it proceeds rapidly, and is encouraged by the confinements of school life, such as standing and sitting for protracted periods without relief afforded by free natural movements.

III

Acute Diseases of the Joints in Infancy and Childhood

A certain number of acute diseases of the joints will be encountered which demand early recognition. If properly treated they will recover promptly; if not judiciously handled, they pass into deformities, many of which are incurable; or destruction of important structures may follow. The age of the child is some guide; acute rheumatism is almost never seen in very young children. One of us has seen one case in a child of seven months. Scurvy usually occurs between the eighth and the twentieth month; hemophilia is more often seen at the end of the first year. A blood examination is of value. If there is a pronounced leucocytosis present, abscess is to be suspected and may require drainage.

Acute osteomyelitis is usually produced by staphylococci or streptococci, though occasionally by tubercle bacilli. In tubercular osteomyelitis, the joint is not restricted in motion; it frequently begins at the epiphyseal line.

Syphilitic periostitis may appear in the first two years of life. Treatment is immobilization and extention.

Chronic joint disease in children is usually tubercular; those cases due to syphilis, rheumatism or traumatism are rare. Rheumatism is almost never confined to one joint. Tuberculous disease of the joint is insidious and its most characteristic sign is limitation of motion caused by reflex spasm. Where the vertebræ are involved there may be no tenderness, though when present it is often severe and paroxysmal. The usual symptoms are fretfulness and disinclination to walk. Gastralgia is a prominent sign of involvement of the dorsal spine and constitutes a valuable diagnostic point. A persistent catch in the breath lends to suspicion of involvement of the dorsal upper spine. In all chronic diseases in children it is important to examine the spine most critically.

Mild grades of polyarthritis may follow the infectious diseases,

as pneumonia, scarlet fever, measles and especially tonsillitis. Arthritis deformans does occur occasionally in children as early as the second year. The etiology is obscure and the classification inexact. We must look for causes of vitiation in the secretions in the ductless glands and to infectious or other toxic influences.

IV

It should be the aim of every medical man to prevent deformities, especially in paralysis; poliomyelitis being the most common. Whenever contractures appear the joint should be promptly immobilized.

First or obvious effects are merely those of muscle weakness. Contributory causes are forces of gravity, the action of the vigorous opposing muscles, arrest of development, defective growth of associated tissues through compulsory disuse, and the results of excess weight applied to weakened structures.

Whenever in the course of rheumatism, poliomyelitis, or other infections, and in wasting diseases, a limb is drawn up and held in fixed positions for long periods, contractures are readily formed which may become permanent. At an early stage efforts must be made to overcome this by application of properly moulded splints, plaster of Paris or sand-bags, to keep the limb extended. Contractures of the tendo-Achilles are especially frequent in poliomyelitis.

Sickly pale children, with clubbed fingers, are often victims of chronic bone disease, of bronchiectasis, of congenital heart trouble. Hence the necessity of critically examining the lungs and heart in all children of this class.

Many cases of lateral curvature of the spine are caused by pleurisy and empyema.

Where the heart is found to be displaced to the right, by no means uncommon, it is necessary to ascertain whether this be a congenital peculiarity or an acquired dextrocardia. The cause must be searched for and if possible removed. A heart forced out of its normal position cannot perform its full work, being rotated on its own axis and presenting unnatural contact relationships with other organs.

Defects of development involving mental deviation or retardation are often the outgrowth of congenital or early acquired organic damage. One of the most important of these is a special form of dwarfing "nanism" described by Roland G. Curtin. The characteristic feature is a mitral stenosis of more or less definiteness, but without functional symptoms or marked dystrophies. This observation sheds light on a

neurotic origin. Rachitis, a disease of nutrition primarily, has associated with it, early or late, so many neurotic phenomena and sequelæ that it is often called a neurosis.

Hysteria, which occurs in males as well as females, occasionally in very young children, affords the key to many varieties of deformity. Some joints become so fixed by contractures that they are as permanent and troublesome as those due to cerebral palsy or poliomyelitis, and may demand cutting operations and fixations. The milder forms of club-foot, wrist-drop, lateral and even rotary spinal curvatures, paralyses and contractures, are often due solely to hysteria, and are remediable by suggestion, domination, isolation and other rational measures.

VII

Incipient Joint Tuberculosis

While it is not possible distinctly to predict the oncoming of tuberculosis, it is possible to recognize certain peculiarities of conformation in children which, along with the family history, should cause suspicion.

During the period between the beginning of the second dentition and puberty, children often present features which are suggestive of tuberculous beginnings. These have to do with the skeleton, the circulatory apparatus, and the nervous system. Rachitic phenomena may be exhibited along with this. The bones are long and thin, with irregularities of ossification here and there; the reach of the outstretched arms exceeds the body height; the thorax is distinctly too small for the needs of the organism, resulting in lack of proper development of the lungs, unless assisted by respiratory exercises. The heart will then be found small and asymmetric, the arterial system insufficient, and the veins excessively prominent, resulting in a slowness of the circulatory activities. Material improvement may result if the child is enabled to enjoy satisfactory opportunities for oxygenation, especially by open-air life and freedom from confining or laborious schooling or other occupation.

The condition of the skin is significant: the presence of pityriasis versicolor and chloasma, and enlarged cervical glands or scars resulting from previous suppuration or surgical interference. In those predisposed to tuberculosis the thorax is unusually long, with marked immobility or retardation of the upper lobes, and retraction associated with a small, round chest, short in both diameters, wide and deep intercostal spaces, stooping shoulders, wing-like scapulæ, and a convex vertebral column.

FIG. 128.—CONGENITAL DISLOCATION OF BOTH HIPS.—(*Dr. De Forest Willard.*)

(a) (b)

M 8 YEARS A 6 YEARS

IG. 129.—CONGENITAL DISLOCATION OF BOTH HIPS.—(*Cases of Lewis Marshall, Esq., M.D. Nottingham, England.*)

Surgeons assert that cases treated between the ages of four and ten ars can be cured or relieved by one means or another. Two methods e most in vogue: one is the bloodless reduction of Lorenz, in which e adductor muscles are torn by forcible adduction, the thigh being xed and extension and fixation made in a vertical direction; the other the bloody reduction of Hoffa, in which the acetabulum is scooped t with the Volkmann spoon. After either of these methods fixation ıst be maintained for a long time in order to obtain a cure.

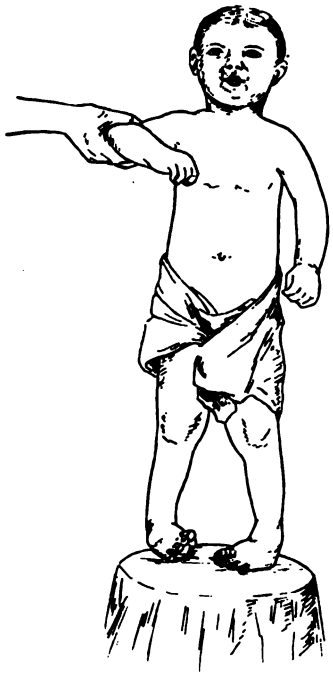


FIG. 131.—TALIPES VARUS.—(*Dr. De Forest Willard.*)

IX

GENITAL MALFORMATIONS

Malformations of the genital organs should be carefully differen- ted as early as possible. The sex impulse plays a highly important rt in the evolution of mind and character, and if there be any pecu- rity of the sexual organs it is far more influential in producing morbid f-consciousness than deformities upon the more conspicuous portions the body. Many of the difficulties may be readily removed or ıaired.

Among the deformities are: ill-developed or absent penis, urethra, or scrotum; adherent or contracted prepuce; phimosis or paraphimosis; hypospadia or epispadia; congenital urethral fistula; short frænum; contracted corpus spongiosum, or incurved penis.

Exstrophy of the bladder may occur in the male or the female, and requires plastic operation, sometimes several in rotation, to accomplish good results. Hermaphrodism, or double or uncertain sexuality, is a grave source of moral mischief and should be discovered early through the custom of routine examination of young children by the medical adviser. If these conditions escape detection when the child is young, it is only by accident that they come under observation in later years. Indeed, it cannot be too strongly urged that the physician should carefully explore the whole surface of every young child under his care, that these conditions may become known and relieved as soon as possible. He ought never to omit examining the penis of a male child, and should himself retract the foreskin to see that it is healthy. He ought to teach the mother to do this regularly, so that the common discomforts produced by preputial constrictions and the accumulations of smega, may be relieved promptly. It is not always necessary to circumcise. Careful stretching by means of a pair of dressing-forceps, every second or third day, carefully avoiding pain and lacerationsg along with the breaking of adhesions by a blunt probe and anointing the corona, is nearly always sufficient.

X

A large experience in dispensary work, not only among children in the medical, but also in special neurological clinics, leads us to believe that the removal of the foreskin is seldom demanded. Little good can be claimed for circumcision above that which can be obtained by judicious stripping or slitting the foreskin with scissors. To be sure, many cases of so-called reflex disturbance result from adherent prepuce, but the importance of this condition is exaggerated by some surgeons and general practitioners, while neurologists credit it with less influence. If the child is of inherently unstable nervous equilibrium, bad heredity or in faulty environment, or both, small degrees of peripheral irritation are capable of inducing convulsions and other morbid phenomena. Brilliant cures alleged to have resulted from circumcision need to be sifted in the light of other factors and the progress of time and development. The rhinologist often affords immense relief by removing the pharyngeal adenoids, and the general surgeon often quotes such

incidents to sustain too sweeping demands for circumcision; but the conditions are not analogous. The obstruction to the ingress of respired air in a child is of vastly greater influence for harm than are preputial adhesions

XI

Peculiarities of the Rectum

The condition of the infant's rectum receives much less attention than it deserves. The sphincter is often too tight. Improving upon the time-honored soap suppository, which acts admirably as a mechanical stimulus to defecation, we have found that it is simpler and more effective to teach mother or nurse to introduce, gently but firmly, her little finger, well oiled, far up into the rectum daily, holding it there a short time. This almost at once induces expulsion of feces. After a few days, as a rule, the procedure may be omitted, though sometimes it may be repeated with advantage, till finally it is no longer required. This method was begun on finding instances of greater or less narrowness of the anal opening, occasionally stricture, which were thus entirely cured. Lack of expulsive power is common, and for this the procedure has proved most satisfactory. Anatomical peculiarities of the rectum, the sigmoid flexure and the pelvic outlet are sometimes so marked as often to warrant the term deformity. The infant's gut is deficient in muscle, hence in peristaltic power. The relatively greater length of the descending colon and sigmoid flexure and its mesentery (which from its parietal attachment to its invagination of the lower loop of the sigmoid, is often greater than the distance from the promontory of the sacrum to the distal bone of the coccyx) and the deficiencies of the peritoneal investment of the tissues, contribute to a double or treble angulation of the gut and a resistance to the descent of the feces. The presence of a typical anatomic valve, which Martin demonstrates, makes also for fecal obstruction. The bony pelvic outlet in the infant is often so contracted, and expansion consequently so limited, as almost to prevent the passage of solid feces. The distensibility of the anus is only about one-fifth of that of the sigmoid flexure and the rectal chambers. All this increases the liability to that common trouble in infants, complete rectal prolapse, involving as it does all the coats of the gut. Inguinal hernia also often results from similar conditions. Along with the great length of the infantile mesentery, must be remembered the absence of the more completely developed adult pelvic organs and other contiguous structures, which

together aid in rectal support. The difficulties mentioned are often escaped by the infant who is encouraged in normal motor acivities. Tendencies to prolapse, if present, should be promptly recognized, and may be alleviated by careful diet, suppositories and fluid injections to favor softness of the intestinal contents and their ready descent through the convoluted gut, the valvulated rectum, and the contracted anus. Hence manipulations are of great efficacy to develop the auxiliary abdominal muscles and the expulsive muscles of the intestinal wall, and directly to expel the contents along the tortuous bowel and reduce the obstruction of the valve. Where there is overgrowth of the rectal valve, it may be obviated by gradual dilatation with the finger as described above. Rhachitic subjects with markedly contracted pelvic outlets need forcible divulsion. To overcome the tendency to rectal prolapse posture is most important. The prolapse is favored by the natural attitude of defecation, which is flexion of the hips. When horizontal extension is maintained during defecation, the danger is less and a cure often follows. To reduce prolapse it is best for the patient to assume the knee-breast posture, to be followed immediately by the attitude of horizontal extension to maintain the rectum in position.

XII

Knock-knee and Bow-legs

In seaking for the causation of knock-knee and bow-legs, in certain children of two or three years of age, with prominent abdomens, there is frequently found an anterior bowing of the juncture of the lower and middle thirds of the femur and tibia; also that in older children when the abdomen begins to be prominent the weight of the body is finally thrown so far forward that the pelvis projects backward and in the corresponding leg deformity results. The shape of the pelvis in infants is very different from that in adults. The angle in the infant is one hundred and thirty-seven degrees, in children one hundred and forty-five degrees, in male adults one hundred and fifty-three degrees, and in female adults one hundred and fifty-five degrees. This explains the fact that bow-legs in girls correct themselves more readily and surely than in boys. The center of the body changes markedly as growth proceeds, the greatest change being between the ages of one and five years, the center dropping one-half the distance from the umbilicus to the pelvis and forming an important factor in the causation of bow-legs and knock-knee.

It may be laid down as a working axiom that *the highest anatomical efficiency is found with the nearest adherence to right lines*, and that curves in the human body are to be discouraged as far as possible by inducing as much rectilinearity as is compatible with the normal structure of most parts, certainly in the backbone and the limbs.

It is essential for symmetric growth that a *right balance be maintained between the resistance of the bone and the strength of the muscle.* The effect of ill-directed muscle action, especially flexor or adductor movements, tends to exaggerate morbid curves. If such a curve is once initiated, muscular action may readily aggravate and make it permanent; hence the danger of allowing children so affected to work or play in such a fashion that too great monotony of movement is maintained. Again, the muscles on the outer surface of the lower limbs in infants are not developed as well as those of the inner group. If the stronger adductors acquire the first invigoration, they readily overmaster the outer abductor ones and lay the foundation for an outward curve. These faults are frequently due to hereditary tendency. As soon as observed it is the duty of the medical adviser to use his judgment and authority to correct them. The means at his disposal are chiefly improved hygiene, leisurely outings, and regulated movements. Sometimes fixation is needed for the curved bones also.

Hip Diseases

(Coxitis, Coxalgia)

Coxitis, or hip disease, the most common form of tuberculosis of the joints, is a seriously disabling malady of childhood. It begins in the bones or synovial membrane, is of slow and insidious progress,

Fig. 132.—Differentiation of Hip Disease. Normal child.

of varied symptomatology, and tends to destroy the articulation. It never develops in healthy children, but always in those whose tissues are vulnerable, especially to tubercular infection. The beginning of the trouble is always some injury which gives origin to a spot of congestion and impaired circulation in the soft portion of the bone. This often cannot be determined as many slight traumata occur to most

children and like that form of tubercular bone trouble called Pott's disease, it may arise without known injury. Coxitis deserves careful study at the hands of all medical men, for upon them often falls the duty of recognition and treatment.

The earliest, most constant, and often for a long period the only symptom is the characteristic lameness. This may be ill-defined, a

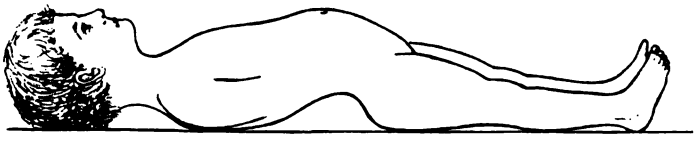


FIG. 133.—DIFFERENTIATION OF HIP DISEASE (COXITIS).

mere favoring of the affected limb, or stiffness or awkwardness, noticeable at certain periods of each day, or only on certain days, with intervals of full activity, and the trouble may continue in this doubtful state for months. It is safe to suspect hip disease in any child in whom a persistent peculiarity of gait or stiffness or lameness is observed, and a thorough examination should be made at once.

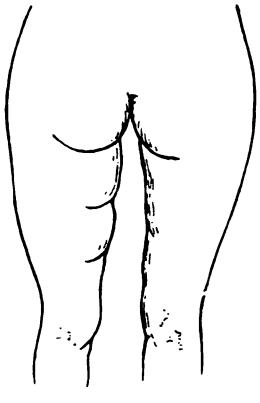


FIG. 134.—HIP DISEASE, SHOWING OBLITERATION OF THE GLUTEAL FOLDS.

There may be little or no pain, at least till late in the disorder. When present, it is referred to the hip, the thigh, or often the knee; it may be in one small spot, as the inside of the knee or the central nerve distribution in the joint itself, or there may be diffuse pain over the surface of the thigh. It may or may not accompany the lameness, may come and go, or may suddenly develop as a terrifying affliction and defy ordinary means of relief. It is often worse at night, waking the sufferer from sleep. In the recumbent position one leg may appear smaller or shorter than the other and muscular atrophy may be demonstrated. A distinct lymphadenitis usually affects the inguinal glands of the diseased side. If both limbs are healthy, a child lying upon a hard surface can easily extend both legs, the back remaining flat; if on one side there is a beginning coxitis, the diseased thigh will remain flexed upon the pelvis, the leg upon the thigh while at ordinary rest. If the leg on the affected side be forced down flat to the table,

ıe lumbar curve will at once become highly arched and can be ob-terated only by flexion of the leg and thigh. A lordosis will appear hen both legs are extended, if one or both sides are diseased. Pain ın be elicited upon deep pressure in Scarpa's triangle just outside ĭ the region where the beating of the femoral artery is felt. This the seat of the pain complained of by the patient when the trochanter r the flexed knee is percussed.

Treatment must be begun at once, and consists mainly in con-inuous extension, fixation of the hip, and the wearing of suitable hoes.

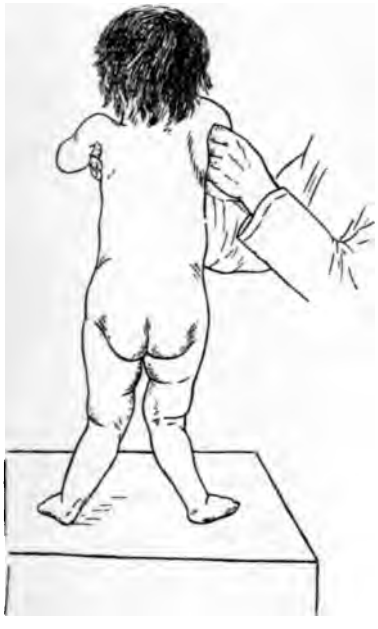


FIG. 135.—HIP DISEASE AND GENU VALGUM.

FIG. 136.—HIP DISEASE; RIGHT LEG, ACUTE ABSCESS (7 MONTHS).—(*Dr. De Forest Willard.*)

SPINAL CURVATURES

In children it is quite common to find curvatures of the spine, ıften so transient or slight as to escape notice unless a careful inspec-ion of the back is made, as should be done in routine examinations. f these are neglected, they sometimes correct themselves spontane-ıusly, or they may remain or grow much worse. Lateral curvatures,

when sufficiently marked to be obvious at a glance, receive attention, but if not they may become fixed and sometimes permanent. The effort to maintain a vertical carriage by one who has a weak back early converts the single curve into three primary and compensatory curves, like the letter S. Anteroposterior deviations and rotations may also be exhibited. This condition depends in part on interference with function in the larger organs, and as these contributory causes disappear so does the curve.

Lateral curvature of the spine arises from a variety of causes, but chiefly those producing weakness of the body from almost any condition. Among these the most potential are nutritional faults, convalescence from acute disease, also pleurisy and empyema, and sometimes congenital misshaping of the bones or the facets of the veretebra. In these treatment must be early or little can be accomplished.

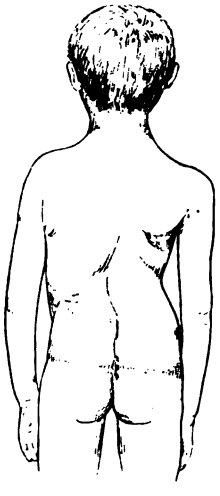


FIG. 137a.

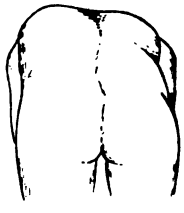


FIG. 137b.

FIGS. 137a AND 137b.—LATERAL CURVATURE (SCOLIOSIS), COMMON FORM.

Barrow holds that the majority of cases of lateral curvature of the spine are caused by pelvic deviation, of which he points out four varieties. Permanent pelvic obliquity is usually the result of defective growth of one of the femoral epiphyses, generally the lower one. To prevent inequalities in the action of the limbs exerting influence upon the spine through the pelvis, the heel of one boot should be thickened until a normal pelvic level is reached. In addition to this the patient should sit upon a sloping seat for twenty minutes two or three times a day.

Habitual pelvic obliquity can be overcome by persistent watchfulness of the patient's habits, and by distinguishing the faulty attitudes assumed in the ordinary activities of life and sedulously correcting them, especially adhesions or rigiditites in vertebræ.

Amesiality of the pelvis is more difficult of correction, because the

nuscular sense of the patient becomes so perverted that finally e-sidedness seems to him straight. In such cases it is imperative ce the patient before a looking-glass and hold a plumb-line to isternal notch, thus demonstrating the obliquity. Then proceed rect the position so that the xiphoid cartilage and umbilicus are

FIG. 138a.

FIG. 138b.

FIG. 138c.

. 138a TO c.—LATERAL CURVATURE, COMMON FORM.—(*Case of Dr. De F. Willard.*)

with the line. Exercises by movements of overcorrection by ions should be then employed systematically.

rsion of the pelvis is usually the result of faulty sitting attitudes. cure sitting correctly is again to be employed for twenty minutes me, perhaps several times a day, getting both knees on the same or with the knee of the affected side extended to the front of its

fellow, the chest meanwhile being maintained in a straight position. Here also wall exercises are important; a pad being placed behind the ilium of the protuberant side, the physician makes pressure, along with a series of exercises in correct standing attitudes. Other exercises should be taken lying down, especially upon the affected side, and using movements which tend to overcome the deviation. Extensor movements accurately performed are always the most useful.

Often among the common forms of postural deformity are a number of fixed curvatures closely analogous to the recovered forms of Pott's disease, which cannot readily be differentiated except by an expert. When these arise, from whatsoever cause, they begin

FIG. 139a.

FIG. 139b.

FIG. 139c.

FIG. 139d.

FIG. 139e.

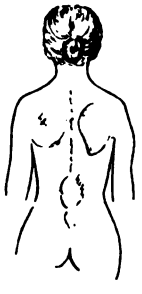


FIG. 139f.

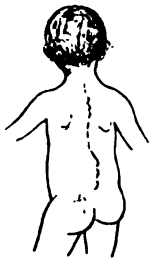


FIG. 139g.

FIGS. 139a TO g.— VARIOUS ATTITUDES SHOWN IN POTTS DISEASE OF THE SPINE.

insidiously, and there will be found changes elsewhere in the bony skeleton, and particularly in the ligaments, requiring recognition and treatment. The changes in scoliosis include alterations in bones, ligaments, and intercartilaginous and muscular structures. The vertebræ may assume a wedge shape and exhibit atrophies on the concave side, and in some cases the adjacent vertebræ become ossified (osteitis). Pressure upon one of the roots of the vertebral arch may

cause an ovoid form in the canal, and the bony fibers of the body of the discs acquire an oblique instead of an upright position. Thus the elasticity of the column is lost and a tendency to rotation is acquired. Along with this change the muscles become contracted or atrophied, because their osseous attachments are brought too close together on the concave side. The muscles on the convex side become relaxed, stretched, and degenerated, while the muscles of the concavity remain rigid. A certain number of these cases will be found to suffer also from flat-foot or other deformities of the feet and ankles, and the treatment of one condition should supplement that of the other.

The symptomatology of lateral curvature of the spine requires little or no description, but it is necessary to attain some skill in measuring the degree of the condition. The curvature may not be obvious upon a fairly critical observation of the back, and can be determined only by placing the child in certain routine attitudes and causing it to make a series of movements by which the curve shall be rendered more prominent. For instance, the child should be made to stand as erect as possible, heels together, toes turned out, the hands apposed so that the fingers shall be accurately adjusted; then these two hands, carefully coaptated, should be thrust far forward, elbows straight, and carried through a half-circle from the vertical above the head to the vertical below; next the same motion should be repeated in a half-bent attitude, while the observer stands in the rear and measures with the eye an outline of the spinous processes as they are thus brought into view or alignment. Again, in estimating rotation, the hands of the patient held in this same attitude should be clasped by another person in front and moved from side to side, rotating the body, while the physician again examines the back. Thus it may be seen that one or another of the movements of the spine will show a degree of rotation not otherwise to be seen, and a number of other movements needless to be described here will bring out latent deformities.

The most important agents for determining the degree of scoliosis are special apparatuses for measuring, which the average practitioner will not be likely to possess, but it is possible to get a very fair record by means of a strip of lead moulded to the back, from which a tracing can be made on paper. This should be done as a matter of record in every case early, to enable the degrees of progress, better or worse, to be compared. This is necessary not only where the patient remains in the hands of the general practitioner, but is to be used later as comparative data by the consulting orthopedist.

In making a diagnosis it is necessary, of course, that the body

of which these shall be made. The plaster cast is often the first and only one available, but for fixed braces a lighter material which can readily be removed or changed and readjusted is required. In many cases the patient can exercise satisfactorily only while wearing a brace. This is an important practical point to bear in mind.

The essential agency for the relief of curvature of the spine is a proper education of the patient to maintain the erect and easy carriage, the normal flexibility of the tissues, and proper coordinating power. These can be acquired only by a slow process of educational and developmental training which may require months or years to accomplish. In certain individuals, so eager are they to regain symmetry, that they will pursue any line of exercises outlined fairly well; but this faithfulness cannot be relied upon to any extent, and again, it frequently happens that faults arise which cannot be foreseen and which must be promptly recognized and corrected. Let me again repeat that forceful regulated extensions are the most important of overcoming contractures and acquired or latent deformities.

Pott's Disease

Pott's disease, or spondylitis, tuberculosis or caries of the spine, is a most serious disabling and often fatal disease whose virulence is in inverse proportion to its early recognition and quality of treatment. The medical practitioner should be not only familiar with the outline of the symptoms, but also alert to recognize the lesser phenomena which precede the spinal deformity, and which can be averted, leaving the one who would otherwise become a miserable invalid or misshapen creature fairly vigorous and symmetrical. Again, the proper treatment in the early stages is purely medical in so far that no interference of a surgical nature is indicated. This is to place the child at absolute fixation and rest for from four to six months, and after that a supporting jacket or brace is to be used along with limited freedom of movement. All this can be determined and carried out to the utmost advantage by the physician without expert help, although it may be a wise course to call in a specialist to pronounce an opinion and to cooperate with him from time to time. But we cannot testify too strongly to the value of an early diagnosis and rational treatment which will save infinite suffering of both body and mind.

If any cause other than tubercular infection underlies pondylitis it is in grave doubt. The old belief, long held, then long in doubt,

of injuries to joints causing or predisposing to the local ravages of tuberculosis has been disproved by experiments. There was no tendency for the germs which were travelling in the blood to lodge in tissues of joints which had suffered traumata. It would seem that inflammatory processes due to trauma, and the consequent reparative processes then initiated, rather tend to protect them from the invasion. This view is strengthened by the results of Bier's method of treatment of tuberculous joints by producing a passive hyperemia, and Noetzel shows that the favorable result is due to a concentration of the natural bactericidal forces by reason of the increased amount of blood brought to the part, and later to the development of connective tissue.

The symptoms of Pott's disease begin most insidiously. There is a gradual loss of color, with disinclination to play or to eat. An

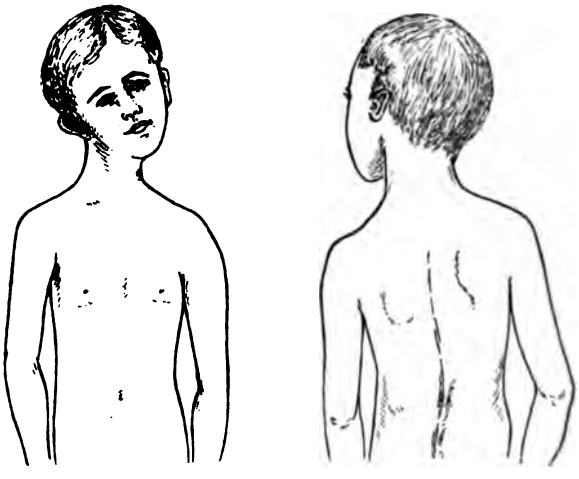


FIG. 140.—TORTICOLLIS ("WRYNECK").

early symptom is pain in the abdomen, vaguely localized or referred to one or another place in succession. At night the patient is restless and starts up from his sleep. In the dorsal form of spondylitis the pain is often referred to the chest rather than the abdomen. Upon examination the attitude and gait of the child are characteristic. The walk is slow, with rigid shoulders and inelastic movements; sometimes one or the other of the feet is affected. The child, if asked to pick up something from the floor, does not bend over as is natural, but crouches down, head held erect, so as not to bend the spine. The muscles of the back and lumbar regions are held rigidly in nature's effort to relieve the diseased spine from all motion. When the disease is in the upper

dorsal region the shoulders are elevated and the head is sunk on the chest. When in the cervical region there is often a spasmodic contraction of the muscles of the neck resembling torticollis. When sitting the child is inclined to hold its head with its hands, or with the elbows on a table or the knees or other support. This is also seen when the lesion is in the upper dorsal region. As the disease progresses the kyphosis can be seen, a backward bending of the spinal column which forms a knuckle at the site of the disease. If it is beginning in the lumbar region the bending is often forward, forming a lordosis. These deformities are brought about by the absorption of a portion of the bodies of the diseased vertebræ, lessening vertical resistance and induc-

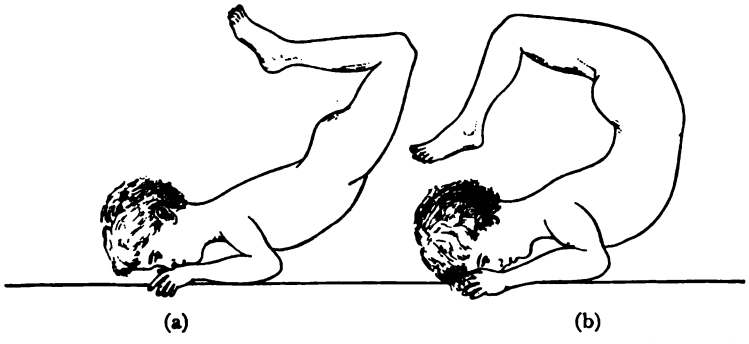


FIG. 141.—DIFFERENTIATION OF POTTS DISEASE OF THE SPINE. (a) Potts disease, rigidity of the back bone. (b) Normal child.

ing the characteristic curves. Still later abscesses may form along the psoas muscle in the iliac, lumbar, or retropharyngeal regions, according to the location of the disease. The iliac and psoas abscesses are chief evidences of disease in the lumbar or dorsal regions. The lumbar abscess is due to lumbar disease, and the retropharyngeal abscess is an evidence of change in the cervical vertebræ.

In the late stages of the disease paralysis may occur, usually of the legs, but sometimes of the lower half of the body. This paralysis is bilateral, and due to meningeal irritation and not to pressure. The degree of the paralysis is not in proportion to the kyphosis. Increased reflex action is the rule, and anæthesias are often present. A bad symptom is rigidity of the muscles of the legs, evidencing destructive changes in the cord.

The recognition of Pott's disease is to be based upon evidences of pain as described, the rigidity of the spine, the hyperconscious gait, the contractured attitudes, the deformities, and sometimes upon the location of abscesses and paralyses. Upon the first four or five

of these points a positive diagnosis can be made. Early or late deformity always appears to a varying degree, but long before this occurs the condition should be recognized and treated. Contracture of the psoas muscle is a valuable sign in differentiating the lumbar from the dorsal form. When a child complains of persistent abdominal pain without coated tongue or evidences of gastro-enteric disorder, and exhibits a rigidity of the spine, as shown by the stiff attitudes and cautious methods of progression, it should be carefully scrutinized for spinal deformities and rigidity. If the condition is recognized before the deformity appears, the child should be at once placed at absolute rest and kept there until other symptoms develop or all subside, and if this be done a large proportion of cases will recover without deformity and be saved from abscess formation and paralysis. The gas-pipe bed frame now universally employed is most useful.

The test for the spinal rigidity is to lay the child face downward, grasp the two ankles with one hand, laying the other hand upon the spine for counter-pressure, and carry the legs upward and backward until the soles of the feet point toward the head. If tubercular disease is present the spine will rise in a very nearly straight or rigid line; if normal it will assume a uniform flexible curve from the hips to the shoulders.

To test for psoas contraction, place the child in the same position, grasp the legs and flex them upon the thigh until the soles of the feet point upward, then gently hyperextend the thigh with the other hand placed upon the lumbar region. If there be contraction the "psoas spasm" will be felt—a vibratile condition or spasmodic twitching of the muscles. A morbid flexion of the thigh is often present on one or both sides, due to contraction of the psoas muscle. This deformity can be recognized early and is distinctive. The kyphosis in Pott's disease is acute; that seen in rickets is longer, more of a curve, and can be overcome by manipulation. The pseudo-palsy of rickets is less pronounced and free from pain or tenderness.

In malignant disease of the spine there is usually persistent and severe pain, as well as early a more marked paralysis, and the patient is evidently much more seriously ill. The deep reflexes are greatly exaggerated in early Pott's disease, and ankle clonus is present. Torticollis may be confused with cervical Pott's disease, but in the tubercular deformity the muscles of the back of the neck are most affected and the chin is elevated. In torticollis the sternomastoid muscle is contracted and the head turned away from the contracted side. Coxalgia is also sometimes confused with psoas contracture, but in

hip disease the motion is restricted in all directions and the joint is tender, while in Pott's disease motion is limited only when in extension and there is no joint tenderness.

If at any time there is a great increase of pain, abscess formation is to be feared, and can be recognized in one of the usual localities, depending upon the location of the disease.

The mechanical treatment of Pott's disease is divided, as has been said, into the prone and the ambulatory stages, and the objects are to immobilize the spine and to support the superincumbent weight of the body, so that the diseased vertebræ may enjoy absolute rest and relief from all weight and motion.

The resting period, or the "prone" treatment as it is called, is now greatly simplified by the use of an extremely clever device of E. H. Bradford, of Boston, known as the Bradford frame. This is made of light gas-pipe of a size to fit the child, giving three or four inches greater length than the height of the patient and one inch broader than his width at the shoulders. It is then covered by lacing two strips of canvas around it, extending from each end, leaving an uncovered interval of from four to eight inches in the center under the buttocks. This frame is then placed on the bed and the patient strapped onto it by webbing, one strap across the hips and two at the shoulders. These are passed under the frame transversely, with one above and one below the shoulders, then diagonally across the body, and each fastened to the other. Similar bands are placed under the lumbar region and the neck to allow the spine to rest in its natural curves. The patient is unstrapped and sponged each day, rubbed with alcohol or anointed with some unguent, and liberally powdered. The patient should never be allowed to sit up, but is rolled from side to side during manipulation.

If the disease is in the upper dorsal or in the cervical region it may be necessary to apply extension also to the head. Upon this frame children should be taken out in the air every day, and there will always be seen rapid improvement in all the distressing symptoms, especially in the pain and the digestive phenomena, and it is remarkable how happy and contented the little patient is after the first week.

This rest should be maintained for from four to twelve months, according to the requirements of the case. When the time comes to do away with the frame some form of support, jacket, or brace can be adopted to allow the patient the use of his limbs and at the same time give as full support as possible to the diseased spine. This ambulatory treatment may be continued for two years or more to allow

firm ossification of the diseased vertebræ, and should be under the supervision of a skilled orthopedic surgeon.

Again, systematic extension movements are needed to overcome the lesser contractures and regain elasticity of tissues, normal poise, and freedom of action.

The Deformities of Rickets

The deformities caused by rickets are so familiar to all practitioners of medicine that it is needless to describe them at length, but some are of great importance, especially those of the thorax and limbs, and should be early recognized, not alone for such treatment as is possible for mechanical or esthetic reasons, but to estimate them in connection with

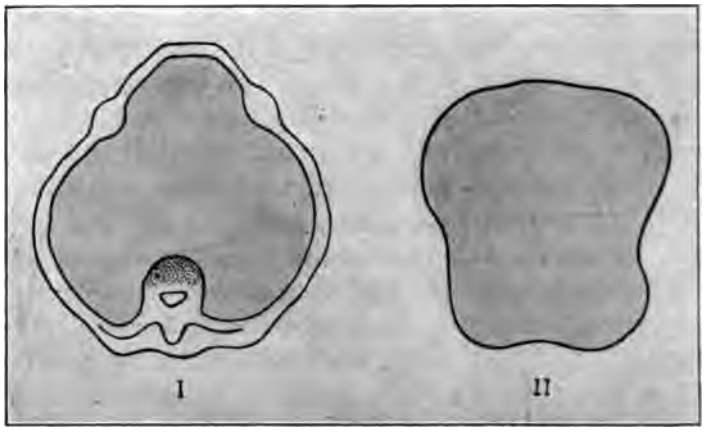


Fig. 142.— Diagrams of Rachitic Deformities of (I) Chest and (II) Head.

their effects upon the contained vital organs and the consequent constitutional depression.

It must be borne in mind that the state of impaired nutrition in rickets produces changes in almost all the tissues. When it is considered that at least seventy-five per cent. or more of all children living under conditions of poor hygiene exhibit some of the phenomena of rickets, and that a very large proportion, impossible to estimate, of the well-to-do classes also show evidences of the disease, it will be seen that in estimating deformities this factor stands preeminent.

Changes in the skull produced by rickets have little bearing upon the intelligence of the individual later in life, whereas changes in the cranium due to other causes may; hence this deformity, although an

obvious one, has little clinical significance. It is quite true that during the period when the fontanelles are usually open and where there is craniotabes, the brain is thus rendered more vulnerable, and is hence subject to such disturbing influences as may come through a moderate degree of violence exerted directly or indirectly upon the exposed brain. Unless the skull acquires a conspicuous change in its shape through the malleability of the bones, this factor is not likely to be important. In regard to the changes in the shape of the long bones, it should be the endeavor of the physician to prevent these as much as possible, and it is not difficult to do so by placing the child at absolute rest, which is easily accomplished by using some means to fix the head so that sitting

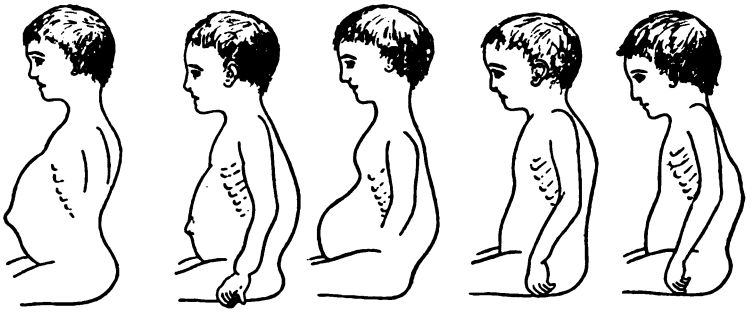


FIG. 143.—DIAGRAMMATIC DIFFERENTIATION OF SPINE DEFORMITIES: (a) Rachitic lordosis (also umbillical hernia); (b) rachitic kyphosis; (c) rachitic kyphosis (also funnel breast); (d) caries of dorsal spine (*Potts*); (e) caries of lumbar spine (*Potts*).

up is not permitted, and then the bony skeleton throughout will be prevented from assuming changes in shape during the time when constitutional treatment is being pursued. Again, where these twistings and curvings of the long bones have been produced it is readily possible to overcome them to a very great extent by making it impossible for the child to sit continuously in such attitudes as induce a bending of the bones or disturbances in the ligaments. The early treatment by fixation in plaster casts or other simple splints will prevent their increase. Often they can be materially remedied by manipulation. Later these can only be corrected by elaborate braces, much time, and cutting operations.

To go into the subject of relief for the deformities of the long bones would require too much space and is a familiar subject to all surgeons.

The thorax is subject to very important and sometimes serious alterations in its shape and capacity during the active process of the disease. The most common abnormality in the thorax is the

anteriorly along the lower part of the chest walls just posterior to the edges of the ribs.

There is also a distinct groove running from the outside of the nipple line on each side, extending obliquely just posterior to the beading of the ribs. This furrow encroaches upon the capacity of the thorax and interferes with the normal expansion of the lungs, especially on their anterior borders, on the left side markedly depressing the position of the heart. The breadth of the thorax, measured through the axillary line, is small above, but more normal below

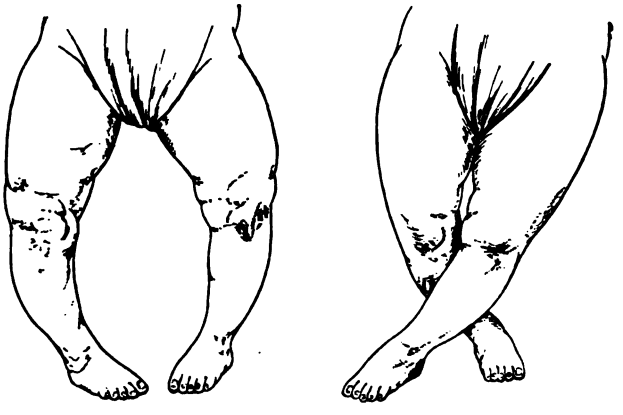


FIG. 145.—RACHITIC DEFORMITY, BOW LEGS.

and as the flat ribs are approached becomes abnormally broad by reason of the upward pressure of the abdominal viscera, which are unusually distended.

The abdomen of the rhachitic child is, as a rule, conspicuously distended by gas. The intestines and stomach are oftentimes dilated. The liver is pushed down and usually enlarged, and the relaxation of the external abdominal tissues along with the increased pressure from the gaseous distention of the intestines often results in hernia, especially the umbilical form. Other evidences of atony are shown in the abdominal and intestinal muscles, and constipation or irritation in bowel actions is the rule.

The rhachitic spine is usually characteristic and to be differentiated from the curves caused by other conditions. The curve is most marked in the lower dorsal and lumbar regions, and is an evidence of ligamentous relaxation and weakness. The child acquires the capacity of sitting up much later than a healthy one would, and the superincumbent weight of the head seems too great for the weakened

muscles, and usually produces a bowing down of the neck and a general kyphosis in the lower portion, not angular, as is seen in Pott's disease. Occasionally the curve may be in the other direction in the form of lordosis.

The treatment of this condition (Pott's disease) is absolute rest for a certain space of time upon Bradford's frame. It is most important to prevent the child's sitting up and assuming those attitudes which tend still further to produce deformity during the period of either very great general debility or local weakness in the ligaments and while the bones are soft and plastic.

For the deformities in the limbs during the early stages splints are often necessary, and much of the curving can be overcome while the bone is still soft; especially is this true if the child is relieved of the superincumbent weight of its own body by rest in the recumbent posture. Forms of exercise suitable for many of the varieties of deformity must be carefully adjusted to the needs of the individual, and persisted in throughout long periods of time. Moreover, for conditions of very great weakness, or where the state of the ligaments and bones is such as to forbid active resisting movements in either a sitting or a standing position, immense benefit is derived from keeping the child upon its back and making use of a number of movements calculated to strengthen the whole skeletal structure without bringing strain upon either the organs, the spinal column, or the long bones.

Treatment by Movements and Coordination Exercises.—In acquiring a proper concept of the word "exercise" it is necessary to bear in mind that the general notion shared by the laity and by medical men themselves is unsuited as a means of therapeutics in these conditions. In the first place it is well to clearly understand the fact that in all forms of heavy exercise, so called, where either dumb-bells or any form of forcefully resisting apparatus is used, or where any considerable strain is brought to bear upon the muscles of the limbs and trunk, the result is merely a temporary muscle building which possesses little or no reconstructive value. Even among professional athletes this has been practically abandoned, attention now being given almost exclusively to movements which make for activity, elasticity, accuracy of poise, and systematic coordination. A child who is disabled either by the conditions described or by chronic heart disease, is unfitted to attempt free exercises or those involving resistance or the overcoming of a dead weight, whether it be from some outside object such as the dumb-bell or weight or a resisting apparatus, or even the weight of its own body. For such a condition it is our custom to pursue for a considerable time

regulated movements while the child is in the recumbent posture, and not necessarily involving efforts of the limbs or trunk. These consist of breathing exercises which chiefly involve activity of that very important, much neglected, and less understood muscle, the diaphragm. Movements of the neck, of which there can be made a great variety, are here of direct use; also movements of the shoulders, shoulder-blades, and trunk muscles, by resisting exercises applied to the head by the operator, and by efforts on the part of the child, properly directed, to raise itself upon its hips and the back of its head until the erector muscles of the spinal areas are thus brought into play and strengthened. Along with these are to be used a very important series of passive movements in which the operator takes hold of the limb and moves and pulls it in certain regulated directions, and by a series of movements and rotations makes tension upon the ligaments and tendons. This can advantageously be combined with massage, especially in and around the joints, and above all upon the important areas lying alongside of the spinal column, both superficial and lower, and upon the deep tissues. Then finally the child is called upon to stretch as far as possible in certain defined directions, sometimes lying on its back, sometimes prone on its abdomen. Then, again, important movements can be made with the hands and wrists both in forcible extensions and flexions without involving strains upon the rest of the arm, the shoulder, or the trunk. The same is true of movements of the foot upon the ankle. These were clearly taught and practised with great success by the Swedes, and can be employed long before it is admissible in any given case to make use of larger or more comprehensive movements. Again, where we have to deal with a deformity of the spine, whether this be of the functional form or where, in a case of Pott's disease, it is admissible to use those exercises, a very large number can be employed with advantage, the child still lying upon its back and gradually brought up to the point at which considerable resisting efforts can be made with perfect safety, the spine still being maintained as straight as possible by lying on the back.

Where more forceful movements are indicated, we have employed with great advantage a narrow padded table to which the child is made fast by means of a band of webbing, or a broad bandage passed across the hips and diagonally between the legs, crossing so as not to bring pressure upon the surface of the abdomen. This is for the purpose of giving a purchase to enable resistance to be employed when permissible. In this way very vigorous resistance movements can be used while the back is held in a fairly correct position.

Where there is a considerable deformity of the back it is an easy matter to place under the prominence certain pads or little pillows filled with sand, which brings pressure where it is required to overcome the deformity. Thus the child is held in a comfortable and safe attitude, and many movements can be encouraged which would be much too forceful should the child be allowed to sit up or stand.

Before exercise is employed in any given séance it is also often of value to precede it by carefully adjusted massage and passive movements which stimulate the local conditions of nerves, lymphatics, and veins, and this places the muscles in the best condition for their subsequent training in activities. Again, a very fair amount of resistance can be encouraged after the contractured tissues have been thoroughly set free by the use of forcible tractions and manipulations, stimulating vascular changes in the stiffened joints or disused areas.

For the overcoming of rigidities and contractures it is always necessary to precede the exercises by these passive movements. Thus little by little, not only on the one occasion but upon subsequent occasions increasingly, a greater degree of freedom of movement is rendered possible, and opportunity is given not only to thus make passive movements and to acquire greater freedom or elasticity from this source, but in case it is necessary to re-educate the motor centers and tracts which have long remained in disuse.

In cases of contracture due to cerebral palsy it is a distinctly curative measure to use extreme flexions and extensions forcibly, not only to break up adhesions and overcome these contractures, but also by this means to give a stimulus all along the motor tracts, and thus improve the long disused brain-centers to an astonishing degree.

In all this, we repeat, *the physician must know what his problem is, what he desires to secure and how it shall be done.* He cannot trust any masseur or physical trainer beyond a certain point. He must himself know what to do, and himself supervise what is done. *He must persist in progressive measures* and be not impatient nor allow the patient or his family to become discouraged. Not only must the condition be overcome by slow and careful procedures, but these must be pursued until a stage is reached which is in effect a cure. *The patient must learn that for many years it is imperative to remain under medical direction;* not constantly, perhaps, but every few weeks or months. And while this seems discouraging, he must remember that while in the meantime freedom of action may be enjoyed and he may act as a well person, *unless this protracted care is exercised the worst results may follow perfectly*

sound-measures. In this the patient is to be the cooperator and not the impatient judge.[1]

THE DUCTLESS GLANDS AS FACTORS IN GROWTH AND DEVELOPMENT IN INFANTS AND CHILDREN

We are familiar with the excellent and recently published works on the ductless glands by Biedl and Swale Vincent, but, being essentially physiological, and presenting as they do the many undeveloped theories that have been proposed by as many investigators, it is impossible to gather from them any clear idea as to actual functions carried out by these organs. Not so with Sajous's conceptions. Initiated in 1903 and 1907, they have stood the test of time, and independent evidence is accumulating on all sides to show that his views will prevail. These are to the effect that the secretion of the adrenals, in addition to its well known power to raise the blood pressure and sustain the tone of the cardio-vascular system, is the oxidizing agent of the blood; that the thyro-parathyroid secretion, in conjunction with that of the adrenals, sustains general oxidation metabolism and takes an active part in general immunity and active defense of the organism against infection and intoxication.

From his viewpoint, the adrenals and thyroid apparatus thus conjointly *sustain life* and simultaneously *defend life.* No one so far has been able to break down this conception. Much evidence is available to demonstrate its strength—to those who read Sajous's writings with an open mind.

As to the pituitary body, the prevailing view (defended by Cushing) is that this organ is also the source of an internal secretion. Whether this be true or not, Sajous's view that the neural lobe and the *pars intermedia* constitute a nervous mechanism which at least governs the thyroid and adrenals, and through them the defensive functions of the body, is also gaining ground. While, as Swale Vincent states, "it is extremely difficult to imagine how such a structure can be regarded as a secreting gland," J. A. Flexner, Amos W. Peters and others have recently brought out evidence showing that removal of the pituitary body is followed by abnormal vulnerability to intoxications.

These few facts will explain why we have adopted Sajous's views in explanation of the processes of growth and development in children.

[1] This chapter on Deformities is based on an article by J. Madison Taylor which appeared in International Clinics, Vol. IV, Eleventh Series, 1902, altered and revised by Wm. J. Taylor.

They alone, in fact, furnish a sound foundation for the profitable study of the subject.

Overgrowth Due to the Pituitary.—Everyone is familiar with the gigantism of acromegaly, a disease traced to the pituitary by Marie. The labors of various Italian observers and of Harlow Brooks in this country, have shown that overaction of this organ was the ruling factor of this morbid development. The prevailing view that the pituitary produces an internal secretion may partly explain the process; by keeping the blood pressure high it influences the various structures concerned with growth. We have, however, a far clearer explanation of the process when the thyroid and adrenals, both known to be concerned with metabolism and nutrition and also with growth, are considered. As we shall see below, the adreno-thyroid system is likewise accepted as a factor in the process (as held by Sajous as far back as 1903).

The pituitary excited by hypertrophic development or disease, besides perhaps sustaining the high blood pressure by its secretion, stimulates persistently the adrenals and thyroid. Thus, by driving oxidation and anabolism at an inordinate pace, the pituitary excites abnormal growth. This participation of the adrenals and thyroid in the process is now, in fact, virtually recognized. Swale Vincent, for instance, states that "there is some evidence that the young animal depends for its chemical stimuli to growth not only upon the adrenal and thyroid bodies, but also upon the pituitary."

Overgrowth Due to the Adrenals.—Excessive growth tends to occur, early in life, between the first and eighth years. In hypernephroma characterized by an excess of tissue in the adrenals themselves and elsewhere, the overgrowth is such as sometimes to suggest gigantism and acromegaly. A child of eight years thus affected may be as large as one of twenty or more, the external genitalia being as fully developed as in the adult, with, as a rule, abundant supply of hair on the face, pubes and axillæ. The body is overnourished and often obese. These now familiar cases can only be explained, even after all the work done in recent years, by Sajous's view that *the adrenals supply the secretion which*, as the oxidizing agent of hemoglobin, *sustains tissue-oxidation and the anabolic phase of metabolism*, *i.e.*, the tissue-building phase of the process, particularly of the muscular elements. All of these are now known to be influenced by adrenal extractives. If we leave out oxidation and metabolism (the prevailing idea, that of Oliver and Schäfer), that the adrenal product sustains the blood pressure and the activity of the heart, the process is not explained. As

a corollary to this fact, it may be mentioned that De Mura found recently that the adrenals actually stimulated growth in experimental animals. The surplus of overoxidation and anabolism they caused (in accord with Sajous's views) clearly accounts for the necessary increase of tissue-nutrition the process of growth entails.

Growth Due to the Thyroid.—The rôle of the thyroid in development is well shown by its use as a remedy in the cretin, or infantile myxedema. The puny, idiotic dwarf, in which the thyroid is, through organic lesions, unable to carry on its functions, is so completely transformed through the development of both mind and intelligence as to be hardly recognizable after one or two years' treatment. The direct influence of the thyroid gland on the process of growth is well demonstrated by the fact that *it is only during the years of growth that the thyroid gland proves effective in increasing the stature.* Later in life, say after the twentieth year, mental improvement may to a slight extent be obtained. In the now recognized influence of the thyroid on metabolism again we find is the essential factor in the beneficial influence, with perhaps a stimulating action on calcium metabolism.

Briefly, it is through the influence of the various ductless glands enumerated on oxidation and metabolism that growth and development of the body are to a material degree governed and sustained. It is by identifying the signs of deficient activity in both adrenals and thyroid that a guide is afforded to satisfactory treatment of these cases. These signs are described below.

The other forms of infantilism, Mongolism, etc., which do not show signs of deficient activity of the ductless glands, have not so far yielded to therapeutic measures.

Symptoms of Adrenal Deficiency.—This condition has been grouped clinically by Sajous into three forms: (1) Functional hypoadrenia, a form in which the adrenals, though not the seat of organic lesion, are functionally defective because of tardy development, debilitating influences such as fatigue, starvation, etc. (2) Progressive hypoadrenia, or Addison's disease, a form in which the functions of the adrenals, or of their secretory nerves, are progressively impaired by organic lesions, tuberculosis, cancer, fibrosis, etc. (3) Terminal hypoadrenia, a form in which occurs a more or less tardy complication of infectious diseases and toxemias, owing to exhaustion of the secretory activity of the adrenals during the earlier and febrile stage of the causative disease.

Functional Hypoadrenia is the symptom-complex of defective activity of the adrenals due to inadequate development, exhaustion by

fatigue, senile degeneration, or any other factor which, without provoking organic lesions in the organs or their nerve-paths, is capable of reducing their secretory activity. Asthenia, hypersensitiveness to cold, and cold extremities, vascular hypotension, weak cardiac action and pulse, anorexia, anemia, slow metabolism, constipation and psychasthenia, are the main symptoms of the condition.

The clinical field of functional hypoadrenia is obviously large, including asthenias so often met with in the four main stages of life: infancy, childhood, adult and old age. These are too often vaguely attributed to "weakness," "exhaustion," "neurasthenia" and suchlike indefinite and misleading terms.

Functional Hypoadrenia of Infancy and Childhood.—At birth the adrenals of infants are relatively large (one-third the size of the kidney); their functions are, however, limited to carrying on the vital processes, at least, during the first year of life. The mother's milk supplies antitoxic products capable of protecting the organism against the destructive action of poisons, whether endogenous or exogenous in origin. This protective influence of maternal milk is clearly defined by the following quotation from Professor William H. Welch (Harvey Lecture): "It is an important function of the mother's milk to transfer to the suckling, through her milk, immunizing bodies, and the infant's stomach has the capacity, which is afterward lost, of absorbing these substances in the active state. The relative richness of the suckling's blood in protective antibodies as contrasted with the artificially fed infant, explains the greater freedom from infectious diseases."[1]

The adrenals acquire, with other organs, the power to supplant the mother in contributing antitoxic bodies to the blood; they supply internal secretions which fulfill the rôle. The adrenals are thus seen to be prominent among the organs whose function it is to protect children from disease.

When the signs of this condition are made clear, they will suggest explanations of the familiar phenomena, including varying degrees of hypoadrenia. Ruddy, warm, firm-muscled, romping children, with keen appetites and normal functions, are those in whom the adrenals are active and of a development commensurate with their age. They

[1] It is a notable fact that infants at the breast are far less susceptible to certain infections, *e.g.*, scarlet fever, diphtheria, measles and mumps, than the artificially fed, or those who have been weaned. (See paper by Louis T. de M. Sajous, *Univ. of Pa. Bulletin* for June, 1909.) The predilection of children to certain infections obviously indicates that it is not only in infancy that vulnerability exists. They are exposed during the first decade and more, or until in some way the hypersusceptibility is overcome.

are ruddy and warm because oxidation and metabolism are perfect, blood pressure is sufficiently high to keep the tissues well filled with blood; the muscles, skeletal, cardiac and vascular, are strong because well nourished and well exercised, and fully supplied with adrenal secretion, which (as shown by Oliver and Schäfer), sustains muscular tone.

As a normal outcome of this state, there is constant stimulation of the functional activity of the adrenals. Muscular activity and maximum food-intake involve a demand for increased metabolism and oxidation, and the resulting greater output of wastes imposes upon the adrenals, as participants in oxidation and autoprotective processes, greater work, more active growth and development, *with increase of defensive efficiency*, as a normal result.

The pale, emaciated or pasty-faced child, with cold hands and feet, and flabby muscles, whose appetite is capricious or deficient—the pampered house-plant so often met with among the rich, represents the converse, as does the ill-fed, frail or overworked child of the slums.

The emaciation and cold extremities indicate deficient oxidation, metabolism and nutrition, owing to the torpor of the adrenal functions. The pallor is due mainly to a deficiency of the adrenal principle in the blood and to the resultant low blood pressure, inducing retroversion of the blood from the surface. Such a child, while not actually ill, is exceptionally vulnerable to infection, owing to the underdeveloped state of its adrenals.

Terminal Hypoadrenia is that form of adrenal insufficiency which occurs late in the course of an acute febrile disease, as a result of the exhaustion of secretory activity, probably aggravated by temporary local lesions to which the adrenals are subjected as defensive organs, during the febrile period of the disease. It should be clearly differentiated from *intercurrent hyperadrenia*, *i.e.*, intense congestion of the adrenals involving danger of rupture and hemorrhage; this may appear at any time in the course of an acute infection or toxemia.

The phenomena of *terminal hypoadrenia* are, among others, late in the postfebrile process, *e.g.*, pneumonia with delayed resolution or convalescence; extreme adynamia, chilliness, nausea, low blood pressure, subnormal temperature, pulse weak and more or less rapid, vertigo, fainting, cardiac failure, diarrhea, Sergent's white line. Such conditions may arise in the course of any disease, but especially in diphtheria, the fulminating cases of scarlatina, septicemia.

Complications of various kinds occur: septic infection, abscesses, bone lesions, tuberculosis of rapid type, other infections, disorders of nutrition; in short, by whatsoever the body-defenses are lowered to

abysmal depths, tissues are rendered vulnerable to the attack of almost any morbific organism.

Thyroid Deficiency or Hypothyroidia. Symptoms.—Here the phenomena are definite enough, though oftentimes not obvious, and occur at all ages. In older persons they are more readily recognized; in children less so. When the clinical picture is kept in mind there should be no difficulty in recognizing relative states of hypothyroidia, and it is important that they should always be estimated in connection with any other symptoms, since upon the right treatment of this factor usually depends success or failure. Deficiency in the thyro-parathyroid secretion, when present, is an efficient cause for defects of development in infants and children, both in mind and in body. It may act alone, or as a powerful contributory agency. The effects too often pass unrecognized, are regarded merely as evidence of apathy, laziness, stupidity or obstinacy.

The phenomena which should induce suspicion of defective thyro-parathyroid functionation are, among others: asthenic disorders of nutrition of varying grades, shown in various directions. The clinical picture is that of mental and physical retardation, depreciation of vigor, loss of cardiac and circulatory tone, loss of color, defects of development and nutrition, loss of normal liveliness, energy, play-impulse and serenity.

Pain of some kind or degree is generally complained of. In young children there may be evidence of peevishness, whimpering, refusing to be comforted, restlessness, starting in sleep, pathetic or exasperating unrest, or screaming. When the child is old enough to indicate the location of pain it will often be found in the back, low down or across the shoulder-blades, or the coccyx, and is rather aggravated than relieved by rest in bed. In some cases migraine occurs, or localized neuralgia. The phenomena which are most in evidence are weariness, weakness, heaviness, languor on waking, feeling worse after sleep, rather than refreshed and relieved. As the day wears on improvement gradually appears.

Temperature is low, may be subnormal at times, or there may be general hypothermia. The extremities are often, or uniformly, cold, with clammy skin and chilliness. In short, the evidences of deficient oxidation and nutrition are general and pronounced. The skin of the body may be normal, while that of the legs, especially below the knees, is rough and scaly. The face is often waxy, pallid, the eyelids puffy. On exertion there is dyspnea, palpitation amounting to distress or pain. The heart is sometimes dilated, with weak systole and murmurs.

Blood pressure is usually low, pulse weak and rapid. Since the blood-forming organs are poorly nourished, there is commonly anemia. Every type of alteration in the blood-cells has been observed in hypothyroidia, but not to any marked degree.

The teeth tend to decay early and become loose, owing to deficient calcium and phosphorus metabolism. Resistance to germs is low, especially where it is usually active, as along the mucous surfaces. The nasopharynx is also apt to exhibit a low grade of congestion. The tonsils show a predilection to inflammation and intestinal tone is lowered, peristalsis less active, feces are voided with difficulty, and there is disinclination to go to stool. The liver becomes passively congested and enlarged, due to the low-grade vascular tension, which explains also the presence of varicose veins and vascular disorders; also biliary and renal colic, an evidence of imperfect competence of the blood. The urine is often highly colored, scanty, with occasionally presence of albumin, casts, sugar or blood. Bones are weakened, hence appear narrow chests, "pigeon-breast," a predisposition to caries, scoliosis, flat-foot, etc.

Loss of tone thus induced, particularly in the arterioles, contributes to the occurrence of hallucinations of light and sound. The mind is usually obtuse; even in the milder cases it lacks "*esprit*," *i.e.*, the ability to grasp the finer points of an argument. In milder cases there is often the wrinkled forehead and arched brow, sorrowful expression, so conspicuous in myxedema and cretinism.

Treatment.—That organotherapy is the only method of treatment which affords any hope in delayed development due to the adrenals and the thyroid, is now well known. Where signs of hypothyroidia occur, thyroid gland should be administered. Small doses are better than large ones. Large doses, by suddenly activating metabolism, cause headache, pains over the kidneys, muscular and hepatic pains, loss of appetite, rapid pulse, fever, a tendency to fainting, tremors and dyspnea. The heart should be frequently examined, and any increase in the pulse-rate of the heart should cause the dose to be reduced.

The dose for a child of one year should not exceed 1/4 grain of tabloid thyroid at meals, gradually increased. For children over seven years 1 grain suffices. For nursing infants the best method is to administer the remedy to the mother.

When adynamia is marked, it is well to add to the thyroid small doses of adrenal gland—1/2 grain for a child of one year. High saline injections two or three times a week should be employed, to keep the intestines free of feces.

The good effect of the thyroid medication is seldom manifest in less than four weeks. In children, the process of rapid growth often induced is generally attended by weakening of the bones. Sajous advises that, to offset the *genu varum* which often results, the child should be given calcium lactate in 5-grain doses, and braces be applied to the legs.

Where symptoms of hypoadrenia are present, both the thyroid and the adrenal glands should be given together, 2 grains of the latter being added to the dose of thyroid recommended above. Pituitary extract is also valuable and more sustained in its effects. But the action of this agent must not be construed otherwise than as that of a legitimate internal secretion, influencing growth directly—since Lewis and Miller (Archives of Medicine, August 15, 1913) have recently shown by a series of experiments which place their results on a definite footing, that pituitary extracts do not influence growth—acting rather as a cardio-vascular and oxidizing tonic whose action is akin to that of adrenal products.

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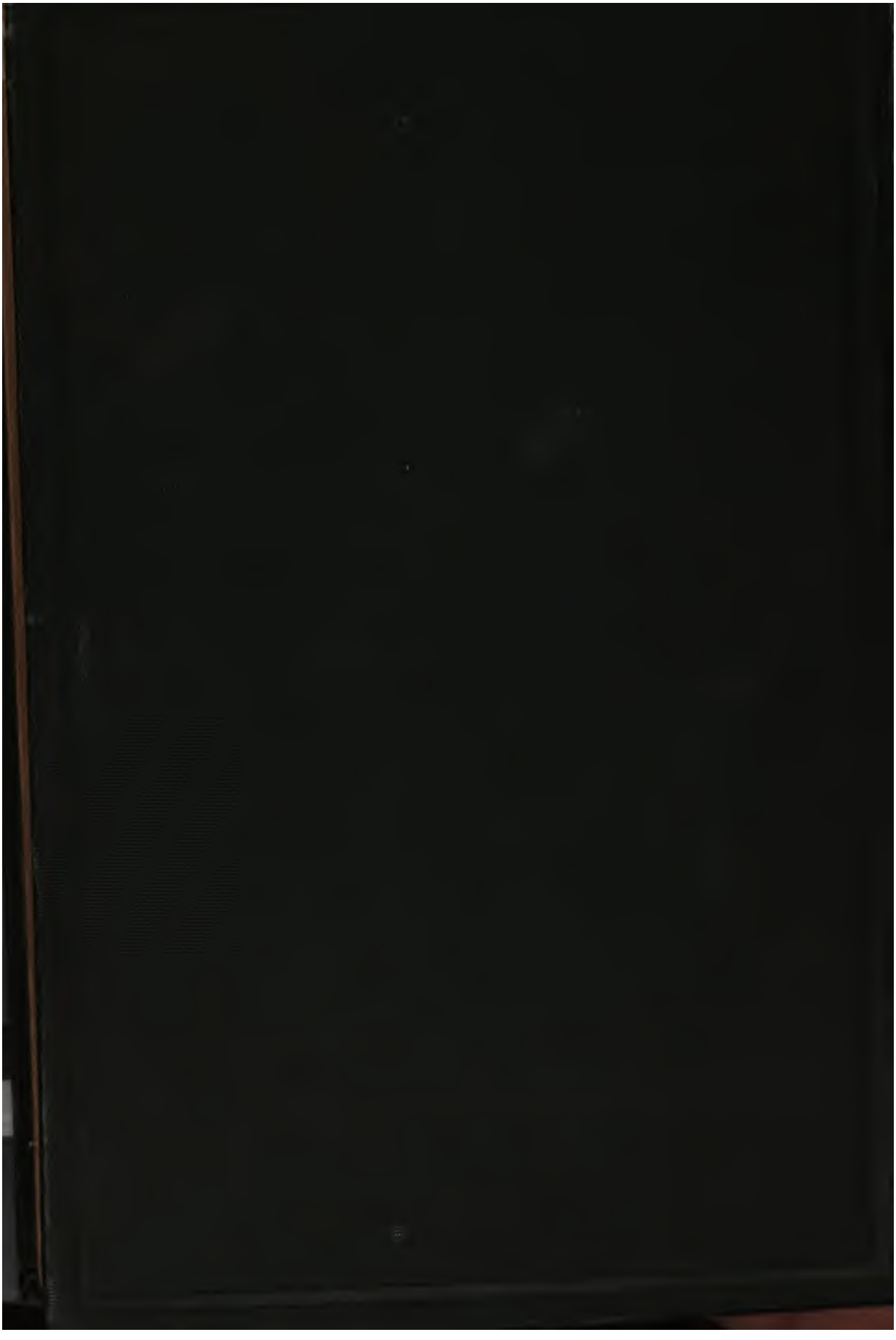
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